

THE METAL INDUSTRY

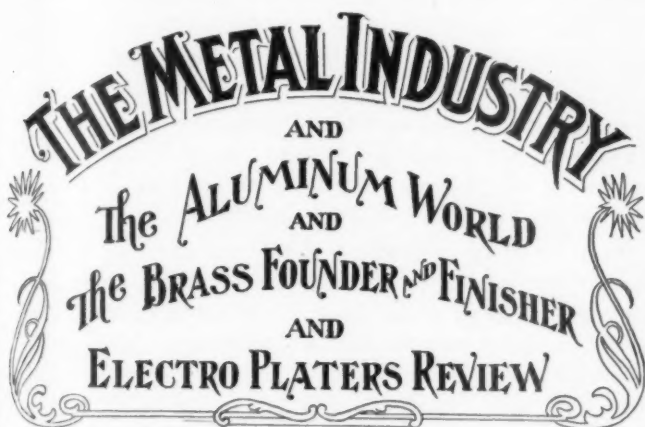
WITH WHICH ARE INCORPORATED THE ALUMINUM WORLD AND FINISHER THE BRASS FOUNDER AND ELECTRO-PLATERS REVIEW.

A TRADE JOURNAL RELATING TO THE NON-FERROUS METALS AND ALLOYS.

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OIL FUEL FOR MELTING PURPOSES.

The use of oil fuel for metallurgical smelting operations and other purposes has been developed to a considerable extent, and is likely to be considerably extended in the future. An interesting and valuable report, embodying the results obtained in a long series of tests, which were conducted for the purpose of ascertaining the relative evaporative efficiency of coal and liquid fuel under forced and natural draft, has recently been issued by the Navy Department. The tests were made by a committee of naval officers under the direction of Rear Admiral Melville, and occupied a period of over twenty-eight months. The report, which is quite voluminous, bears testimony of the thoroughness and the high ability of our naval officers, and the amount of valuable information it contains bearing upon every phase of the subject of burning oil fuel, is remarkable. The tests were executed with a boiler of 2,130 square feet of heating surface, and the results obtained, as well as the exact conditions under which the tests were made and the manner in which they were carried out, are given in extenso. A number of burners of different construction were tested. A number of important practical conclusions have been drawn from the test. Among other things, it has been shown that the efficiency of oil plants will be primarily dependent upon the character of the installations of fittings and auxiliaries. The form of the burner, as long as it is manufactured in accordance with general well known principles, and all its parts are accessible for overhauling, will play a very small part in extending the use of crude petroleum. It has also been ascertained that the simpler the furnace, the greater its efficiency, and that the erection of brick arches only tends in many cases to reduce the volume of space necessary for effecting complete combustion. In every fuel oil installation special provision should be made for the removal of the water which will collect from various sources at the bottom of the supply tanks, inasmuch as even a small amount of water will interfere with the efficient and satisfactory work of an oil fuel installation. The evaporative efficiency of crude and refined oil was shown to be practically the same, no matter from what locality the oil may come. It was also concluded that the use of steam as a spraying medium will undoubt-

edly serve most satisfactory for general purposes, though the results of the tests show that the consumption of fuel oil cannot be forced to as great an extent with steam as the atomizing agent, as when highly heated compressed air is used for this purpose. It was further emphatically brought out during the tests, that it was necessary to make special provision for straining the oil in view of the liability of every burner to clog and this fact would make the installation of a strainer both on the suction and discharge pipes of the oil-feed supply extremely advisable. The actual evaporative efficiency of a pound of oil as compared with a pound of coal is considered to be in the ratio of 17 to 10. Probably no more extended and accurate tests have been made anywhere, and the collection of valuable practical data embodied in the report easily outdistances anything done heretofore. The officers in charge and the crew of the U. S. torpedo boat *Rodgers*, who operated all the various forms of oil fuel burners experimented with, justly deserve to be complimented upon the manner in which they have performed this arduous and at times positively dangerous task.

THE ZINC INDUSTRY.

On examination of the yearly statistics of the zinc industry it is interesting to note that the production of zinc in the United States has practically doubled within the last ten years. The production of spelter in 1893 was 78,832 tons, while in 1903 it amounted to 159,219 tons. The production in Europe has also increased steadily, though not at such a rapid rate as that in the United States. The total European production in 1896 was 344,355 long tons, against 422,630 long tons in 1903. The share of the United States in the world's total production in 1896 was 17.4 per cent., in 1903, 25.2 per cent.

The world's production of zinc is, of course, mainly absorbed in the galvanizing and the non-ferrous metal industry, and a not unimportant share of the increase in consumption has to be attributed to the growth of the latter. Especially the consumption of sheet zinc has made rapid strides in Europe as well as in this country within the last decade, and this article is now used for the manufacture of a surprising number of stamped, pressed and spun goods for decorative and utilitarian purposes. Zinc lends itself easily to such treatment if handled in the proper manner. A valuable property of the metal is its resistance to atmospheric influences, inasmuch as it covers itself with a thin but very hard film of oxide which effectively protects the metal beneath it. A goodly share of the increased consumption can also be claimed by the zinc casting industry, which has made considerable progress within recent years and is second to none in the variety and artistic taste shown in the manufactured articles.

There is no reason to doubt that the progress made thus far in the application of zinc to the manufacture of a variety of objects will be continued and that the next few years will see a further increase in the use of articles made from this unpretentious but very valuable metal.

ACCURATE WEIGHING IN THE FOUNDRY.

One hears more or less frequently of instances where work has been turned out in the foundry, which while not exactly bad, yet for some reason or other failed to come up to the requirements, i. e., the results do not come up to the mechanical properties expected, etc. In such cases as a rule nobody seems, apparently, to be able to point out a reason why the work is not as satisfactory as it might be.

A certain share of these mysterious, unsatisfactory results is undoubtedly due to inaccurate weighing of the various ingredients which enter into the composition of an alloy. Every practical man knows that there is a tendency everywhere, not alone in the metal foundry, on the part of the workmen, to take things for granted and to conclude, when weighing something, that the weight is "near enough." Now, while this may be true for ordinary cases, it is nevertheless true that if it is desired to obtain the best and most uniform result, good enough is not good enough, but that the weights must be as accurate as possible. Especially is this the case when, as in many modern alloys, comparatively small quantities of a certain ingredient enter into the mixture, which small additions exert a very decided influence, either on the favorable or unfavorable side, upon the properties of the resulting alloy. Accurate weighing in the latter case is a *sine qua non*.

Frequently, however, in weighing out small quantities, it is not so much the carelessness of the man who does the weighing, but the inaccuracy of the balance which he uses, which is at fault. Balances are employed in many, especially the smaller, foundries, which are not nearly sensitive enough for small loads. A balance should be used for the limits of weight it is constructed for, and fractions of an ounce cannot be weighed on a heavy scale. Consequently, even with the best care on the part of the weigher there is no telling exactly what weight has been used, and it is not surprising, therefore, that it is often found impossible to duplicate the results obtained or to get them as uniform as may be desirable.

While the above is not the only, and in many cases probably not the determinative, cause of trouble in the foundry, yet there is no doubt that more than one foundryman by paying close attention to this point will save himself a good deal of worry and expense.

The Index of THE METAL INDUSTRY for Volume II, ending with this number, will be published in our next issue, January, 1905.

The American production of platinum for 1903, as reported by the U. S. Geological Survey, was valued at \$2,080, a slight increase over the year 1902. The metal was obtained from Southern Oregon in the placer gold. The imports of platinum during 1903 were valued at \$2,055,933.

The value of the production in quicksilver in the United States during 1903 was \$1,544,934, an increase in value over 1902 of \$77,086. The metal was obtained from Texas and California.

THE IMPORTANCE OF THE CASTING TEMPERATURE.

By G. B. WATERHOUSE.

Next in importance to steel, and possessed of a longer history, come the alloys of copper with the various metals and metalloids, and they enter very largely into the industrial usages of every nation. It is a wide stretch from the early brass and metal workers to those of to-day, and the founder of the present has many more facilities at his disposal. By means of chemical analysis, which is deservedly coming more and more into use, alloys of standard composition can readily be made. In the event of a melt turning out badly, the harmful impurity can often be detected, with the result that it is excluded from succeeding heats. The microscope also fully deserves a place in every foundry. Since its application by Dr. Sorby, in 1864, to the study of metals, it has proved a valuable adjunct for research in this line. Especially has this been the case with regard to steel and cast iron, and it may prove equally valuable in the domain of the copper alloys.

It is mainly due to these and other applications of science to the industries that almost all conditions in the foundry may be controlled. There is one very prominent condition that needs thorough investigation, and that is the correct temperature at which the molten metal or alloy must be cast in order to obtain the best results.

The importance of this condition is widely recognized, and a few quotations in support of this statement may be given. One writer says, in speaking of bronze*:

"The temperature of the fused metal exerts a considerable influence upon the quality of the casting. Experience has shown that for small articles the bronze must not be heated too strongly, as otherwise the resulting casting is blown, and one blow-hole suffices to destroy it entirely."

Prof. R. H. Thurston,** in his investigations at the Stevens Institute of Technology, on the copper-tin series of alloys, recognized the importance of this condition and tried to estimate the temperature of the molten metal by pouring a small portion into a known amount of water and noting the rise in temperature. He also mentions the case of zinc, which, when cast at too high a temperature, is coarsely crystalline with a platy fracture and is not malleable.

Apart, however, from these rather general notices in the text books, and the experience stored up in each foundry foreman's head, little definite was known on this subject until a little over a year ago. Four years ago Mr. Andrew Carnegie added to his other gifts by placing some funds at the disposal of the British Iron and Steel Institute, which latter founded a number of Carnegie scholarships, with the object of forwarding research in the field of metallurgy. Two years ago one of these scholarships was awarded to Mr. Longmuir, of Sheffield, England, who devoted himself to the subject of casting temperatures. It was the writer's privilege to work in Sheffield at the same time as Mr. Longmuir and thus to be able to follow his research step by step. It is very satisfactory to say that the work was considered to be so good that a Carnegie medal was awarded to Mr. Longmuir.

The methods employed in the research were decidedly practical. In the case of each alloy 50 pounds were melted. One-third of this was poured at a high temperature, the next third when the metal had cooled, to a fair casting heat, and the remainder when the metal was on the point of solidifying. At each time of casting three sets of bars were made, such as are shown with the runner head in Fig. 1.

By this means the three sets of bars were of the same composition and had received the same treatment, the only variation being in the casting temperature. It was, of course, necessary that this temperature should be accurately measured for the purposes of this research. The Le Chatelier pyrometer, which is for high temperatures what

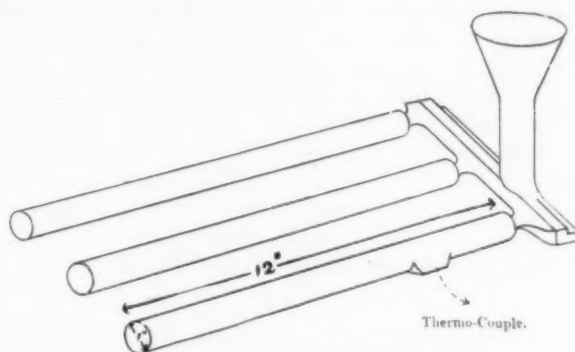


FIG. 1—TEST BARS.

the thermometer is for low ones, provided the necessary means. Three thermo-couples were used, and each one was so placed in the moulding box containing the mould for the three bars, that almost the whole of the metal poured directly over it. Its position is indicated in Fig 1, and Fig 2 shows the system adopted; by using the three-way switch each thermo couple could be coupled up in turn with the mirror galvanometer employed.

The alloys so far studied include gun metal, yellow and red brass, muntz metal, cast iron, malleable iron and steel. The copper-tin and copper zinc alloys appear to be remarkably sensitive to the influence of the casting temperature, as will be seen by the results. In none of the experiments did the influence of the casting temperature fail to show; and, what is still more important, *no succeeding treatment*, either annealing or forging, *entirely*

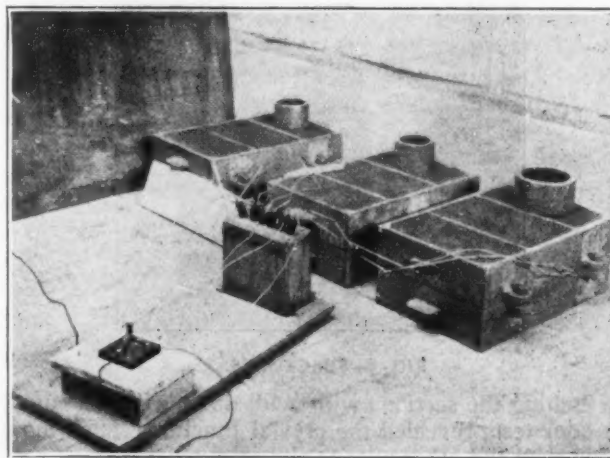


FIG. 2—TESTING ARRANGEMENT.

removed these effects. In all of the alloys it was found that the tenacity and ductility increased as the temperature of pouring fell from the high to a fair casting heat; and further cooling caused a distinct drop in the mechanical properties.

Table I. gives the results obtained with the red brass. the composition in each case was: Copper, 89.6%.
Zinc, 10.2%.

*Wm. T. Braunt. *Metallic Alloys*, p. 174.**R. H. Thurston. *Alloys, Brasses and Bronzes*, pages 324, 488.

TABLE I.

Cast.	Temperature Centigrade	Maximum stress lbs. per sq. in.	Elongation in 2"	Bending Angle.
Hot..	1,308° (2,386° F.)	15,355	13.25	180° cracked
Fair..	1,073° (1,963° F.)	28,332	26.0	180° unbroken
Cold..	1,058° (1,936° F.)	12,700	5.5	105° cracked

The bending angle was very instructive. A bar cast at the high temperature bent 180 degrees and then cracked, the one cast at the correct temperature bent 180 degrees and was then hammered flat without developing any crack; whilst the one cast only two minutes later gave a bending angle of but 105 degrees. A consideration of the tenacity and ductility is also full of interest.

The gun metal is only slightly below this in interest. Its composition was: Copper, 87.5%.

Tin, 10.2%.

Zinc, 1.8%.

The important figures are given in Table II.

TABLE II.

Cast.	Temperature Centigrade.	Maximum stress per sq. in.	Elongation in 2"	Bending Angle.
Hot..	1,173° (2,143° F.)	18,762 lbs.	5.5	30°
Fair..	1,069° (1,956° F.)	33,237 lbs.	14.5	40°
Cold..	965° (1,769° F.)	24,680 lbs.	5.0	40°

The bars cast at the fair temperature would successfully pass standard requirements, whilst the other two, which were of the same composition, proved too low in the tests.

In connection with the other alloys it will be sufficient to mention that they fully confirm the above results. An examination of prepared sections of the alloys even with the highest powers of the microscope, did not throw a decisive light on the cause of the results given in the tables. The main factor appears to be the cohesion between the faces of the crystals, and not between the particles. This was brought to notice in the case of gold and copper as early as 1896 by Professor Arnold.*



FIG. 3—FRACTURES.

In etching the sections with acid, those from the alloys with poor tests revealed the crystal junctions much more quickly than the other alloys; and this structure was very aptly described as "loose" by Dr. Sorby.

The only guide to the judging of the correct casting temperature is experience combined with a study of the mechanical tests of the castings.

Fig. 3 gives the appearance of three runner heads from the same alloy cast hot, fair, and cold. It is found that when the alloy is cast hot there is an actual rise of the metal at the point of solidification as shown at A. With

*Influence of small quantities of Impurities on Gold and Copper. J. O. Arnold & J. Jefferson. *Engineering*, February 7, 1896.

the correct casting temperature there is a uniform feed over the whole head as seen at B, whilst the alloy cast cold exhibits a central pipe.

In this way the runner heads serve to forecast, in a measure, the qualities of the casting.

The research outlined above affords a very good instance of the value of practically applied science; and also of the good work being done by the Carnegie scholars.

In conclusion a careful study of Mr. Longmuir's original papers may be recommended to those interested in the subject. They are:

1. The Influence of Varying Casting Temperature on the Properties of Alloys. *Journal of the Iron and Steel Institute*, 1903.

2. The Influence of Varying Casting Temperature on the Properties of Steel and Iron Castings. *Journal of the Iron and Steel Institute*, 1904.

WAX WIRE FOR MAKING CORES.

A new material for core making has made its appearance upon the English market and has been in use for some time with good results. It serves to vent the core. It is well known that a core must be properly vented in order to prevent blowing and in straight cores this is readily done by means of a wire, but in instances of intricate cores (and these are the ones which need the most perfect venting), the problem is difficult to solve. The use of wax wire, however, entirely obviates the trouble.

The principle of the process is very simple. The wax wire comes in various assorted sizes, so that the proper kind may be obtained for all classes of cores. The wire is simply rammed up with the core and the whole placed in the oven to bake. The wax, of course, melts and leaves the vent entirely free for the gases to escape during the casting operation.

The wax wire is being put upon the market by Messrs. Alfred Field & Co., of 83 Chambers street, New York City. The price is about 50c. per lb., and as it is very light a pound goes a long ways. The wire must not be confused with the ordinary wax tapers which are often used for this purpose. The latter are made of brittle material, while the wax wire of Messrs. Alfred Field & Co. is tough and pliable. The breakage of the wax taper in the core means a lack of clear channel and hence trouble. With this wax wire no such difficulty is encountered. Again the wax tapers have a large wick running through them which prevent the proper clearance when melted.

The wax wire has now become a regular requisite in the foundry, and certainly forms a safe and satisfactory method of venting cores.

At a meeting of the Brass Manufacturers of the United States held at the Iroquois Hotel, in Buffalo, N. Y., on November 15th, prices were advanced about 5 per cent., made necessary in consequence of the recent advance in metals and raw materials. Subsequent changes or advances will be governed by the conditions of the metal markets, which at the present time are firm, with an indication of an upward tendency. The meeting was well attended, enthusiastic and quite satisfactory.

Two exhibits in the Foundry Building at the World's Fair which drew many visitors were the Porteous portable melting furnace, which was in constant operation, and the molding machines of the Adams Company, of Dubuque, Iowa, which were kept busy making molds.

EXPANDING AND FLANGING TUBES BY MACHINERY.

BY LUTHER D. LOVEKIN.

The flanging of copper tubes, as practised in the majority of copper shops in the country, is a most laborious and time-consuming job. The flange is first turned off on the face and bored and the copper tube is then inserted and hammered in by hand. The almost inevitable result of the latter procedure is a distortion of the flange. As the hammering does not produce a tight joint, it is necessary to have recourse to brazing. This, however, has very decided disadvantages,

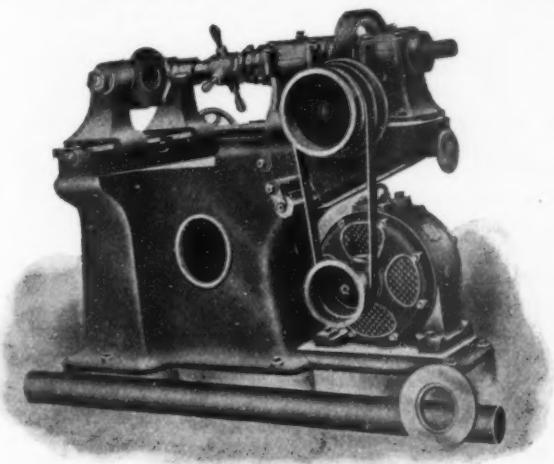


FIG. 1—COMPLETE MACHINE.

inasmuch as it is apt to injure the copper tube and, moreover, to warp and twist the flange on account of its being heated. It is therefore necessary to re-face the flange, which operation consumes much time, for instance, from one to two hours with a 4-inch pipe.

Already as far back as 1889, when in the employ of one of the largest shipbuilding concerns in the country, the writer's attention was drawn to the lack of improved machinery in the copper shop. He then constructed a small hand-crank machine, which rolled the tube into the flange and beaded it over and made a perfect and tight joint. There was no necessity of brazing the joint, as was shown by repeated tests, where in every case the tube ruptured in the middle without showing any signs of leakage up to a pressure of from 1,500 to 2,000 pounds. A joint made by penning and brazing stood up to 1,200 pounds pressure and then began leaking around the brazing.

The success obtained with this machine led to improvements in the construction. One of the latest types, which is now put on the market under the writer's patents, is shown in the adjoining Fig. 1. It is driven by an electric motor, belted to cone pulleys for the purpose of obtaining variable speeds. The upper cone pulley shaft bears a worm, which meshes with a suitably housed worm wheel located on the rear bracket of the machine. This worm wheel is provided with a long sleeve and a shaft passes through its center, to which motion is transmitted by means of a feather so arranged that it can slide in a key way in the sleeve. The bracket can move forward and backward by means of a lead screw and suitable gearing. Provision is, of course, made for collars and antifriction rings on the shaft, as can be easily seen in the illustration. The construction thus outlined allows the central shaft to revolve freely, but it cannot move, unless the bracket is moved by means of the lead

screw. The shaft at its front end forms a socket for the purpose of receiving the various flanging tools.

The front portion of the machine consists of two sliding heads mounted on suitable guideways. The heads have a right and left-hand screw and suitable gearing by which they can move from each other at equal distances from the center. They are made of cast iron, fitted with detachable clamping jaws of cast iron, which jaws have tool steel V grips for the purpose of holding the pipe which is to be flanged centrally and preventing it from turning while it is being expanded. The cast-iron jaws have suitable grooves for holding the flange independently of the pipe. The grooves are faced on the rear side so as to be in perfect alignment with the central shaft, which arrangement permits the flange to be placed exactly in line, while suitable set screws arranged at the back end force the faced portion of the flange against the faced portion of the jaws.

The expanding tool proper is shown in Fig. 2 and consists of a shank and body of cast steel in one piece, bored out to receive a forged steel mandrel. The body is slotted out to suit the feeding screw F, in order to give the inner mandrel E the proper movement necessary for expanding. The feeding screw F engages with the feeding wheel G, so that any movement of the latter causes the former to move outward or inward as desired. The feeding wheel G is held in place by a nut at the rear end, which nut also takes the thrust due to forcing the expanding and flaring rollers ahead. The shank is arranged at its front end so as to receive a series of detachable heads to suit the various sizes of pipes. The heads are made of cast steel and are provided with a series of slots, suitably finished to receive the expanding and flaring rollers, which are held in

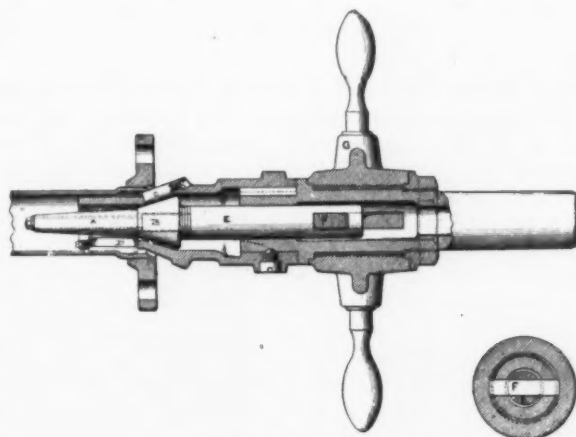


FIG. 2—EXPANDING TUBE.

place by set screws. All faces on the heads coming in contact with rollers are hardened. The central rollers are mounted freely on the reduced portion of the mandrel E and are provided with suitable antifriction washers at their rear end to absorb the thrust. They are made of hardened tool steel.

The principle embodied in the expander is that of a central revolving roller, upon which operate the expanding rollers, the mandrel having no work to perform further than forcing the central rollers outward and inward, as desired. They are therefore not sub-

jected to the immense torsional stresses of other types, which constantly require new mandrels. The central rollers have no bearing on the mandrel whatever. The operation of expanding is thus very simple. After the tool is in position in the machine and the pipe and flange set central with the spindle, all that is required is to start the motor on the machine which revolves the tool. The expanding is done by simply holding the feeding wheel fast, as this advances the inner mandrel, which causes the rollers to expand. Turning this feeding wheel in the reverse direction causes the rollers to collapse. The expanding tool will be found desirable when setting the pipe central; thus, in order to insure the "V" grips being properly adjusted, it is well to advance the tool inside the pipe and expand out enough to hold the pipe central, then examine the "V" grips and the jaws to see if the bottom of the grooves are at least $\frac{1}{8}$ of an inch clear at the side of the flange; then adjust the "V" grips to come in contact with the pipe (while this side clearance is maintained in the jaws, clamp "V" grips solid to jaw); release the expander and grip the pipe firmly by turning the hand wheel provided for such. This operation is only necessary when setting the first piece of pipe, in order to avoid any mistake, as when once set for a certain size flange and pipe, all others of the same size can be set completely ready for expanding in about two minutes' time.

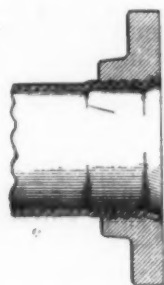


FIG. 3—FINISHED JOINT.

Fig. 3 shows the most recent method of rolling copper and steel piping in flanges. All tools are also provided with cutters to face off the ends of the pipe after it is expanded into the flange if desired simultaneously. These joints have in every case stood pressures of from 5,000 to 5,900 lbs. per square inch, and in all cases the pipe will give way before leakage occurs at the joint.

The method also lends itself easily to the expanding of valve seats, for which purpose tools are made to work in conjunction with turret lathes, the tool being held fast and the valve revolved on the face plate. The seat is placed in the valve, as shown in Fig. 4, and the tool is then forced up until it reaches the face of the seat. After this is done, all that is necessary is to hold the hand wheel which feeds the mandrel forward and the small rollers outward until the expansion is complete. I believe this method to be far better than screwing seats in valves, and it will be found a great help to the makers of large gate valves as well as other valves.

Comparative tests of the strength of joints made by the above method and by the old method of brazing resulted as follows: A test by gradually applied hydraulic pressure on a piece of 4" inside diameter copper pipe, 5-32" thick, each end of which was hammered and brazed into composition flanges 1 $\frac{5}{8}$ " thick,

and which was provided with steel bands to prevent it from bulging and bursting, showed that it began to elongate at 600 pounds per square inch. A permanent set of 1-32" was reached at 800 pounds and at 1,900 pounds the pipe burst near one flange.

A similar test was made on a piece of 4-inch, inside diameter, copper pipe, 5-32 of an inch thick, each end expanded into cast-iron flanges 2 $\frac{1}{2}$ inches thick by my method, otherwise being the same as test No. 1.

At 3,000 pounds per square inch, elongation was 1-32 of an inch, no permanent set in length of tube.

At 3,500 pounds per square inch, elongation was 1-16 of an inch with a permanent set in length of tube.

At 3,800 pounds per square inch, commenced to pull flange off of tube very slow.

At 3,400 pounds per square inch, flange slipped on tube 5-16 of an inch with a jump.

At 600 pounds per square inch, flange slipped on tube 5-32 of an inch, pressure dropped to 400 pounds per square inch and, gradually getting less, pushed the flange completely off the tube.

It was noticeable that after the joint slipped 5-16 of

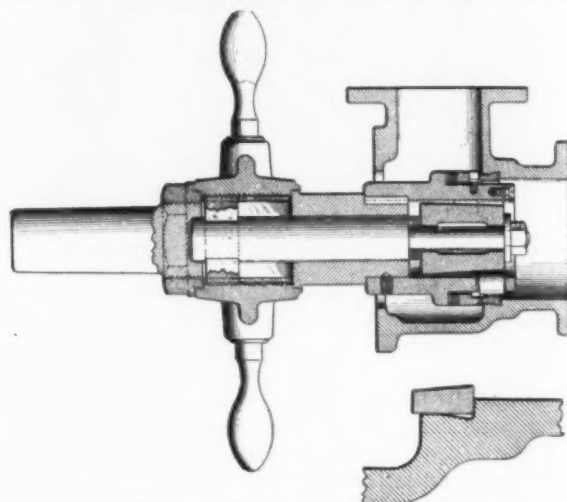


FIG. 4—VALVE SEAT EXPANDER.

an inch and applying the pressure a second time, there was absolutely no leak.

There were three grooves in the bore of the flanges, $\frac{1}{8}$ of an inch wide by about 1-64 of an inch deep. These grooves were filled with the copper and sheared off during the 3,800-pound test, but the flaring at the ends was compressed into the hole in the flange and drawn through. The flange on the other end showed that it had also started. The expanding was perfect, as the copper tube shows every tool mark in the boring of the flange; it also shows that the metal had flowed well into the grooves.

The difference between the strength of the pipe brazed and the one not brazed is particularly noticeable, viz:

Using the U. S. Navy formulæ for copper pipe

$$T = \frac{P \times D}{16} + \frac{1}{16}$$

and solving for P on the above thickness of pipe, viz., 5-32 of an inch, we have

$$\frac{3}{32} \times 8000 = 187 \text{ pounds}$$

per square inch working pressure that 4-inch I. D. \times 5-32 of an inch copper pipe is good for.

In the case of the brazed pipe we have
800 pounds elastic limit

187 pounds working pressure

about $4\frac{1}{4}$ as the factor of safety up to the elastic limit.

In the case of the expanded pipe we have
3,500 pounds elastic limit

187 pounds working pressure

about 18.7 as the factor of safety up to the elastic limit. This shows that the strength of the brazed pipe was lowered 4.4 times below the strength of the expanded joint not annealed, and, furthermore, shows the utter futility of brazing copper pipes when proper methods for expanding are available.

These machines and tools are manufactured by Dienelt & Eisenhardt, of Philadelphia, and sold exclusively by the Scully Steel and Iron Company, of New York and Chicago.

PRODUCTION OF COPPER IN 1903.

In the extracts from "Mineral Resources of the United States," published by the U. S. Geological Survey, Mr. C. Kirchhoff gives the total production of copper in the United States in the year 1903 as 730,044,517 pounds, including 32,000,000 pounds produced from imported pyrites and ores and matte. The world's production is given as 585,081 long tons, divided as follows: Europe, 94,020; North America, 384,138; South America, 40,865; Africa, 5,230; Asia, 31,360; Australasia, 29,468. The 117,000 tons of copper consumed in Germany during 1903 were distributed among the different consumers as follows: Electrical works, 46,000; copper rolling mills (rods and sheets), 18,000; brass rolling mills and wire works, 32,500; chemical works and blue vitriol, 2,000; shipyards, railroads, for castings, alloys, German silver, etc., 18,500.

ALLOYS OF ALUMINUM, COPPER AND CADMIUM.

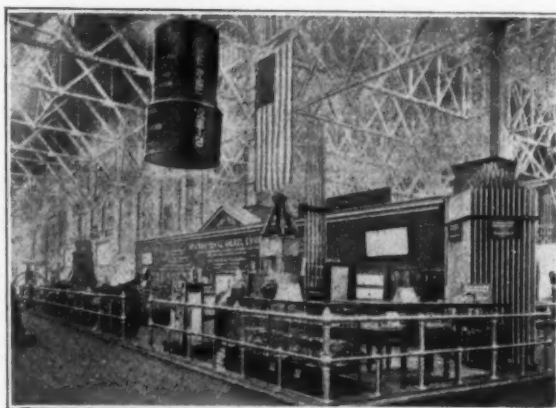
Pure aluminum being very difficult to work on account of its softness, it has been customary to give it hardness by alloying it with copper. It was found, however, that even as small an addition as 6% of copper was sufficient to make the metal so hard that it breaks like glass.

An alloy made by the German Meteorit Gesellschaft is stated to unite the good qualities of pure aluminum and of the aluminum copper alloys, without having their defects. It is made by melting together 4% of copper 2.5% of cadmium and 93.5% of aluminum, or 6% of copper, 3.5% of cadmium and 90.5% of aluminum. Notwithstanding that in the latter case the percentage of copper is 6 to 90.5, the alloy is not brittle and can be worked easily, so that it is particularly applicable to the manufacture of objects which are cast first and then subjected to mechanical treatment.

We have received from the Metallgesellschaft and Metallurgische Gesellschaft, of Frankfurt-on-the-Main, Germany, their eleventh annual issue of Comparative Statistics of Lead, Copper, Spelter, Tin, Silver, Nickel, Aluminum and Quicksilver covering the years 1894-1903. The publication contains much interesting statistical information on the production and consumption of the metals mentioned.

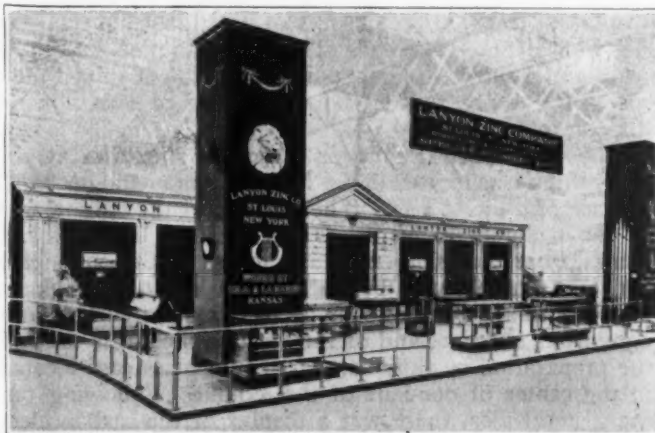
METALLURGICAL EXHIBITS AT ST. LOUIS.

The exhibits in the non-ferrous metals and alloys in the Metallurgical Building and Metal Pavilion of the World's Fair, St. Louis, were confined to one each in nickel, zinc, lead and aluminum. With the exception of a sample board of tubing drawn by the Detroit Copper and Brass Rolling Mills and shown in one of the Michigan mining exhibits and the announcement at the Nickel Company's booth that the nickel sheets and wire were made by the Coe Brass Manufacturing Company, of Torrington, Conn., there was nothing in the Metallurgical Building to represent the brass and copper manufacturing industry of the United States. To be sure there were plenty of brass and copper products in the different palaces of industry shown as a part or as a whole of various displays of manufactured goods, but nothing more than what we have mentioned in the department of Metallurgy.



NICKEL EXHIBIT.

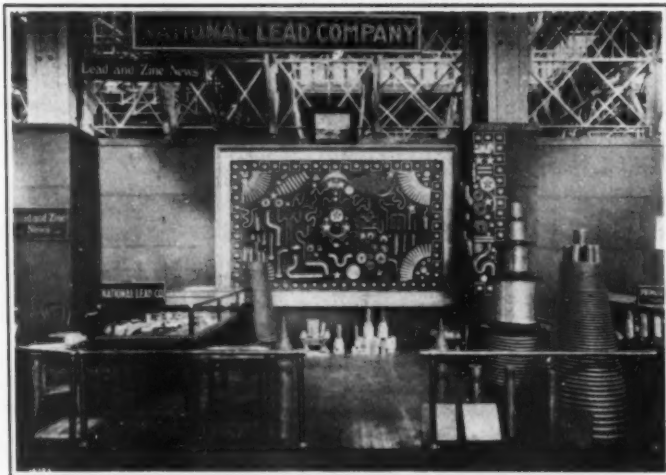
The nickel exhibit of the International Nickel Company, of New York, attracted a great deal of attention, and the various uses of nickel were shown from a model of the largest nickel steel casting ever made down to a solid nickel medal containing a likeness of Joseph Wharton, who first produced malleable nickel. The display of nickel tubes, sheets, wire, household goods and nickel alloy hardware was of particular interest to every metal founder and worker. The Nickel Company had gathered together the finest products of nickel that could be obtained from the various manufacturers of the United States.



LANYON ZINC COMPANY.

In order to properly represent the zinc industry and give an educational value to their exhibit, the Lanyon Zinc Company, of St. Louis, though at present manufac-

turers of spelter, sheet zinc, zinc rod, wire and strips only, gathered together from various manufacturers many examples of zinc articles. The use of some of them was more or less familiar, while others were along lines which have heretofore been made from other metals. The most striking feature of the exhibit was a zinc facade 66 feet long, used as a background to the space, showing the application of zinc to architectural work such as doorways, cornices, gables, pediments, etc. Upon the two large columns located near the corners of the exhibit were displayed handsome stamped zinc lions' heads and ornaments, church organ pipes of zinc, a large washboard showing the various styles of ribbing used in standard makes, a section of a flight of stairs, showing the use of zinc stair treads, nosings and stair corners and white bronze medallions. Piles of spelter, a number of casks of sheet zinc, a box of flat sheets, and a table of corrugated zinc, with a large display of wire rods, tubes and bands in the several show cases. Besides these were shown solid zinc nails for roofing purposes, zinc roofing tile, corrosion-preventing plates for marine and stationary boiler use, zinc cable hangers, cyanide discs, fruit jar tops and bottle top specialties, dry battery cups, etc. Galvanized sheets and various galvanized articles should not be



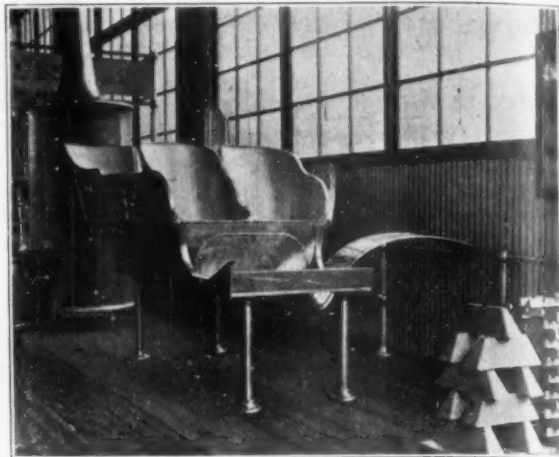
NATIONAL LEAD COMPANY.

omitted from mention, as 50 per cent. of the spelter produced in the country is consumed for galvanizing purposes. The adaptability of zinc for roofing purposes was well shown by the zinc tile roof upon the Metal Pavilion.

The National Lead Company's exhibit consisted of a display of traps, different sizes of pipe, babbitt metal, solder, etc. There were coils of tin and lead pipe, and sheet lead, and a show case containing a display of mixed metals, also lead ores and lead in the process of corrosion for making into white lead.

The Pittsburgh Reduction Company's exhibit at the Exposition was located in the Metal Pavilion and occupied a space of 25 x 50 feet. The purpose of the exhibit was to show aluminum in all its stages, from the ore as it comes from the mines until it appears in the completed article. Accordingly the exhibit may be said to have begun with a display of samples of bauxite, hydrated and anhydrous alumina, and of the various chemicals used in the preparation of alumina, placed in a glass case located in the center of one-half of the exhibit. Following out the general idea, there was a display of the carbon electrodes and bath material used in the reduction of alumina, then a collection of aluminum and its alloys in ingot form, all arranged in glass cases, in appropriate order. Surrounding this and appropriately located were shown samples of aluminum sheet, wire and tubing, and a great

number of completed aluminum articles ranging from a comb to an entire automobile body. The greater part of the exhibit was devoted to this display of completed articles, which was furnished partially by the Pittsburgh



AUTOMOBILE BODY—ALUMINUM EXHIBIT.

Reduction Company and partially by the manufacturers of finished aluminum articles. The automobile body shown in the illustration was part of the exhibit, and probably the largest piece of aluminum work on the exposition grounds. It weighed 150 pounds and was built of sheet of one-sixteenth, one-eighth and three-sixteenths of an inch in thickness. To strengthen the box aluminum bars L and [shaped were used, and the door locks and angles were made of brass.

A feature connected with the Metal Pavilion which attracted a large crowd every afternoon was the demonstration by the Goldschmidt Thermit Company, of New York. This company manufactures the thermit for welding iron and steel, also nickel thermit for melting nickel and pure manganese for use in the brass foundry. These metallurgical products are the invention of Dr. Hans Goldschmidt, of Germany, and are manufactured in America under the direction of Mr. E. Stütz. At their World's Fair exhibit their representative would every afternoon ignite a quantity of Thermit and show how iron and



GOLDSCHMIDT THERMIT COMPANY.

steel could be readily welded. The operation would always draw many sightseers, it being one of the most attractive features of the Metal Pavilion.

The Allyne Brass Foundry Company, of Cleveland, Ohio, had an exhibition of auto castings in the Foundry Building, World's Fair.

NEW ELECTROPLATING MACHINES.

With a view to facilitate the plating, especially of such articles which cannot readily be plated in a revolving drum or similar contrivance, nor by being wired in groups and suspended in stationary vats, J. Bailey, of Walsall, England, recently patented the machine illustrated in the adjoining figure.

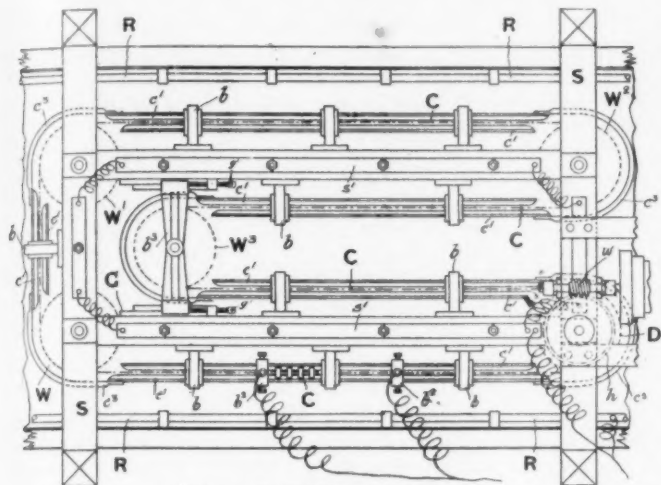


FIG. 1—BAILEY'S MACHINE.

The apparatus is shown in plan view. It comprises a wooden structure S, from which is suspended a travelling conveyor chain C. The latter is arranged horizontally above the plating solution and moves a short distance above the surface. It is driven from the shop shafting by a pulley which actuates the worm wheel w and the helical wheel h, thus turning the chain wheel D which is sitting on the same shaft as the latter. Four other chain wheels, W, W¹, W² and W³, are mounted in the same plane as wheel D and form revolving supports for the conveyor chain. The latter is endless and rests by its T links in a channel c¹, which is supported by brackets b from the wooden structure S. The individual links are so constructed that the chain can readily be taken apart, and they are provided with eyes for inserting the wires which carry the work. A recess is also provided at the bottom of each link for hanging small wired articles.

The anodes A are hung around the vat on a metal rail R, there being four rows of them. The cable from the positive pole of the dynamo is divided and connected at various points to the anode rail R and the strips s¹. The cable from the negative pole is similarly divided and makes contact with the metal channeling c¹ by means of little bridges b², and the ends of the channeling are, as a further precautionary measure against loss of current, connected by thick copper wires c³. The wheel W³ is mounted on a bridge b³ which can slide on the guides g, and it is therefore possible to adjust the tension of the conveyor chain to the desired amount by means of the screws g¹. The work to be plated may either be slung on a plain sling of wire, or it may be hung on straight hooks, inserted into every link of the chain. It then travels continually around the four rows of anodes, the combined area of which is much greater than that of the articles to be plated. It is claimed that by this method the plating is deposited very rapidly, and that on account of the constant circulation of the work the deposit is smooth and perfect and not in the least granular. When the conveyor chain is loaded with work, the

process is continuous, and as plated work is taken off fresh work may be hung on.

Another apparatus recently patented by W. R. King, of New York, and assigned to the Hanson and Van Winkle Co., belongs to that type of machines which are especially designed for the plating of small articles by placing them in a revolving drum. The special object of the inventor has been to arrange the mechanical construction in such a way as to provide for an easy removal and replacement of the drum, and doing away with the necessity of throwing off the driving belt or otherwise disturbing the parts of the driving mechanism. It is also intended to buff or polish the articles while they are being electroplated. The machine is shown in the adjoining Fig. 2 in vertical cross section. It can be used with any ordinary plating tank 2, with sides 3 and ends 4 and 5, and tied by tie-bars. The anodes are suspended from bar 8, which is fastened by hoops 7 and connected with another anode bar by means of rod 10. The drum itself is made of any non-conducting material and consists preferably of a basket of wicker work 24, provided with wooden end plates, through which holes 26 are bored. The basket is provided with a cover 29 of wicker work, with fastening devices 30. The drum is placed upon a central conducting shaft 31, one end of which shaft has a flattened end piece, covered on both sides with insulating plates 34. The combined thickness of the flat end member and the two insulating plates is such that they can be readily inserted into the transverse slot of the enlarged end of the driving spindle 18. The object of the insulating plates is to prevent the deposit of metal on the flattened end of the shaft, which would otherwise be difficult to remove.

The basket is suspended in the solution by means of a suspension frame, which consists of a center bar 35, by which it can be lifted, a cross rod 36 at each end and an arm 37 extending downwards from each cross rod, terminating in a bearing 38 at its lower end. Each arm also carries a hook shaped piece 39, by which it

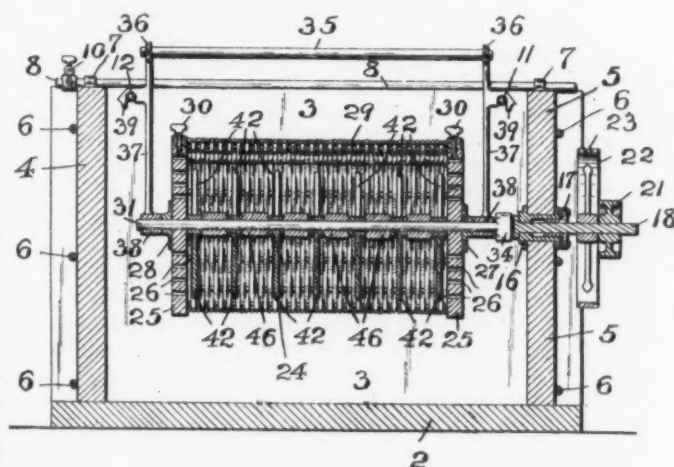


FIG. 2—KING'S MACHINE.

rests on the supporting bars 11, 12, which are connected to the negative pole. A number of contacts 40, each of which consists of a hub portion provided with any suitable number of radially extending or hook-shaped arms 42 are arranged upon the shaft 31, and separated from each other by collars 46 of wood.

Thus, when the drum is revolved the arms of the contacts come into contact with the small articles placed in it and the latter are thus constituted kathodes and become electroplated.

A recent German patent by Meurant also shows a drum which is constructed in the form of a wheel with two rims of good conducting material, the distance between the two rims being determined by the average length of the materials to be plated. The rims are provided with holes of any required shape into which the articles are introduced. Another solid rim is arranged on the outside and a fourth one on the inside of the perforated rims. The articles to be plated, for instance, bolts, are stuck into the holes of the rims after the outside solid rim has been removed. The latter is then fastened on again and the drum is turned, with the result that the bolts change their position continually, so that a constant shifting of contact points takes place. By this means and also on account of the continuous stirring up of the plating solution it is claimed that a very even deposit is obtained, especially as the articles can never cover each other and consequently always present their whole surface to the anode.

NICKELING SHEET ZINC.

A French process for nickeling sheet zinc is described by Brantely in a recent number of the *Journal de l'Electrolyse*. Nickeling of sheet zinc is a delicate operation, and its achievement depends principally upon a good preparation of the metal before it is introduced into the nickel bath. The latter acts almost always upon one side of the sheet only. The preparation of the sheet consists in the first place in bringing it to a perfect polish, which is not the least of the difficulties. This polish is produced with a buffing wheel, or polishing disk, which revolves at a very high speed, on an average 3,000 revolutions per minute, and rubs the surface to be polished with a paste of medium consistency made of Vienna lime and oil. The polisher must be very experienced in this work to be able to accomplish it successfully, for he has to judge by the eye if the polish is sufficient, though he is not able to see it very clearly on account of the polishing material, which the wheel in its rotation spreads over the whole surface in a layer more or less thick. Only such sheets of zinc are subjected to the polishing which do not show the slightest blemish, and in all cases the zinc to be nickeled has to be of the very best quality.

When this first polishing is over the sheet is subjected to a second polishing operation, identical with the first, with the exception that Vienna lime alone is used. This second operation effects the complete removal of the grease and finishes the polish begun in the first. In well-equipped plating works this second polishing is performed entirely by machines, in which the polishing disk is of the same size as the sheet itself. The latter is fastened on a movable carriage and travels continuously under the disk.

The sheets are then rinsed off with much water, and if the operation has been carried out in the right manner the water will wet the polished surface completely. If it does not do so, it is a sure sign that the sheet is still greasy in spots, and the latter have to be removed. When an absolute cleanliness has been attained, the sheets are immediately taken to the copper bath, so that they have no time to oxidize in the air.

If the sheets are to be coppered on both sides, so as to imitate the appearance of nickeled copper, both sides of

the sheets have to be polished with equal care. If, as is usually the case, they are to receive a coating on one side only, they are placed back to back in the cold copper bath, with the polished sides outside, fastened together by four clamps, one at each corner, or more, if necessary. They only stay long enough in the copper solution to give the polished surfaces an even coat of copper of sufficient thickness to prevent the zinc from being attacked in the nickeling bath. Generally from one to two minutes are sufficient for this purpose. If the sheets are not well fastened together no great damage is done, inasmuch as only a very small quantity of solution can pass between, and moreover the rough surface of the zinc is not well adapted for a deposit.

When the coppering is finished the sheets are rinsed with much water, in order to get rid of all traces of the copper solution, which might spoil the nickeling bath. This is a most important point, which cannot be too strongly insisted upon. They are then introduced into the nickeling bath and special precautions have to be taken that the non-coppered surfaces do not come in contact with the bath, as the latter attacks the zinc very quickly, with the result that both the bath and the plating are spoiled. One method consists in placing the sheets back to back in a special frame, with a sheet of rubber between them, and is an operation which can be carried out very rapidly by experienced workmen. It has the disadvantage, however, of leaving a small border around the four sides of the sheet which does not receive a deposit and has to be cut off at the end of the operation. Another method consists in covering the side not to be nickeled with a very thin coat of paraffin, and placing them in the bath, with the paraffined sides touching each other. This paraffining is done by machines, and while it overcomes the above-mentioned disadvantage, is a very delicate operation, and besides it is necessary to paraffin the edges also.

The nickeling bath which is used by preference has the following composition: Double sulphate of nickel and ammonia, 8 ounces; ammonium sulphate, 1 1-3 ounce; boric acid 3/4 ounces, and distilled water, one gallon. The sheets are placed between two nickel anodes and the current density must be pretty strong, from 9 to 11 amperes per square foot. The sheets after they have been covered with a sufficient coat of nickel, are taken out, well rinsed off and submitted to a more or less energetic polishing, according to the thickness of the coating of nickel.

The above method is also applicable for the nickeling of all zinc objects, being modified according to the articles to be dealt with.

A new nickel company has been organized at Portland, Me., with the title of the United States Nickel Company, and with a capital of \$500,000, with the following officers: President, W. N. McCrillis; treasurer, J. A. Nile; clerk, O. H. Hersey. The company report that they own and control 300 acres of mining property in the northwestern part of Maine and that they have a property that carries sufficient values of nickel to enable them to market their product successfully.

A superintendent in the plating department of a large New England works congratulates THE METAL INDUSTRY on the fine appearance of the November number. It was one of the best issues the superintendent had seen, and he has read THE METAL INDUSTRY from the time of the first issue.

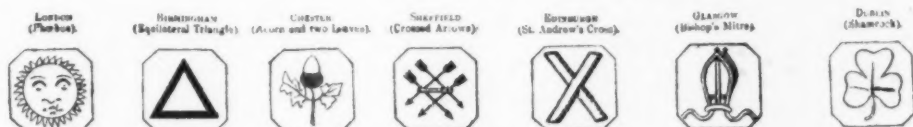
HALL MARKING ON PLATED GOODS IMPORTED INTO ENGLAND.

Up to the present time all gold and silver-plated wares imported into England, after being assayed, were marked in the same way as those of British make, only with the addition of the letter F in an oval-shaped escutcheon. British manufacturers were dissatisfied at this, as they claimed that the letter F was not distinctive enough, in being altogether too insignificant and obscure to show at a glance whether a given piece of plated ware was of British make or an imported product. It was claimed that it could be easily taken as a date letter or entirely obliterated by dishonest dealers. The agitation for better protection of home manufacturers at last culminated in an act of Parliament which provides for the marking of foreign plate with a special and distinct set of designs. The latter are so much different from those used on British-made wares that even inexperienced buyers can distinguish for themselves whether the wares are imported or not.

THE PRODUCTION OF ALUMINUM IN 1903.

According to the annual report of the United States Geological Survey, compiled by Dr. Joseph Struthers, the production of aluminum in the United States during 1903 is estimated at 7,500,000 pounds, as compared with 7,300,000 pounds in 1902 and 7,150,000 pounds in 1901. Accurate statistics have not been possible to obtain, inasmuch as the sole producer in the United States, the Pittsburgh Reduction Company, has, as usual, refused to even approximately state its output. But judging from the extension of the uses of the metal and its alloys for such constructive and decorative work as requires lightness and no great strength, together with the increased quantity of aluminum in the form of wire and bars used to replace copper for electric current conductors, it is fair to assume that the production of the metal in the United States is steadily on the increase. This assumption is strengthened by the fact that the quantity of bauxite, the crude mineral from which the aluminum is extracted, consumed dur-

Particular Marks for each Assay Authority.

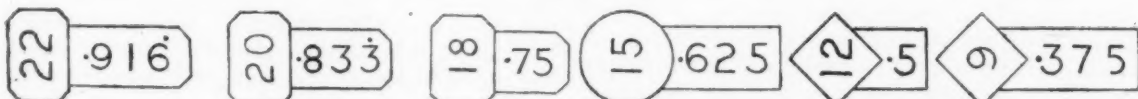


GOLD MARKS.



SILVER MARKS.

Standard Marks



GOLD MARKS.



SILVER MARKS.

BRITISH HALL MARKS.

The bill was passed by the British Parliament in its last session and the Privy Council, by order of October 24, 1904, has given effect to its provision. The particular marks illustrated in the adjoining figure, for which we are indebted to the *Ironmonger*, must from now on be impressed upon foreign ware by the individual assay offices. The illustrations only show the shape and form of the various marks and do not indicate the actual sizes which the particular assay offices will stamp upon the goods. In addition to the marks, the annual date letters will also be added, as usual, by the various assay offices.

As a rule, the majority of the British public does not seem to care whether the articles they buy are imported or not, as long as they suit their taste. It is claimed, however, by British manufacturers that many people would prefer British goods if they could readily identify them. It is expected that the provisions of the act will shut out from the country a good deal of imported imitations of old English plate.

ing the last few years has been increasing from year to year.

Dr. Struthers regrets that the secretive policy concerning the development of the industry continues to be pursued by the various companies manufacturing aluminum. He points out that doubtless a free interchange of ideas on the reduction, refining and working of the metal, as well as the special practice followed in making its various alloys, would help to develop this branch of the metal industry and in consequence benefit each and every contributor to the general fund of knowledge. As an example he cites the rapid and phenomenal progress in the iron and steel industry in the United States as being largely attributable to the willingness of each individual manufacturer to describe and discuss his own practice and thus, by co-operation, help the others and in turn be helped by them.

The Dresses Machine Tool Company, of Cincinnati, Ohio, are re-designing their line of brass working machine tools.

CORRESPONDENCE DEPARTMENT

In this Department we will answer questions relating to the non-ferrous metals and alloys. Address THE METAL INDUSTRY, 61 Beekman St., New York

Q.—A subscriber wants a solution for putting in iridescent blue colors upon metallic articles.

A.—The following solution is said to give good results: Dissolve 7 ounces of cream of tartar in 1 gallon of water and $3\frac{1}{2}$ ounces of tin salt in a quart of water. Mix the two solutions and heat to boiling and allow the precipitate produced in the operation to settle down. The clear solution is then poured off the precipitate and added with constant stirring to a solution of $6\frac{1}{2}$ ounces of sodium hyposulphite in a quart of water. The combined solution is then heated to boiling and the articles are immersed. They have to be taken out when the requisite shade is obtained. Another solution is obtained by dissolving freshly precipitated carbonate of copper in ammonia water. Copper sulphate solution of the strength of $\frac{3}{4}$ lb. to the gallon is precipitated by the gradual addition of a concentrated solution of sodium carbonate. The resulting copper carbonate is filtered off and well washed on the filter. It is then brought into another vessel and dissolved in ammonia water in such a manner that a small quantity of copper carbonate still remains undissolved and the solution is therefore not too ammoniacal. Success with these solutions will not be obtained until after repeated trials, as the coloring of articles demands experience, and the composition of the solution is not the only determinative factor.

Q.—A subscriber asks for a gun metal electroplating solution for watch cases.

A.—A gun metal or black nickel plating solution may be made by dissolving 3 ounces of carbonate of ammonia in a gallon of ordinary nickel plating solution and adding 1 pint of ammonia water. One ounce of white arsenic is then brought to the consistency of a thin paste with a little of the nickel solution, and when in this condition is added to the main bulk of the solution. A sufficient quantity of potassium cyanide is added to clarify the solution. The anode to be used is of nickel and the current density should not be too strong, as otherwise the work is apt to come out dirty gray. The anode should also be kept clean and a little more arsenic should be added when the bath has been in use for some time.

Q.—A brass founder states that he has had trouble with cores in making large bronze bushings, which came out very rough on the inside. He states that the metal was not poured at too high a temperature.

A.—Better results have been obtained in such cases by giving the cores several coats of graphite of a good quality, which procedure might bring the desired result also in this case.

Q.—A subscriber wants to know a pattern mixture cheaper than Britannia, which he has used but finds too expensive.

A.—A mixture of 80 parts of lead, 10 parts of antimony and 10 parts of tin may be used and the amount of antimony decreased if the alloy is not tough enough. It will melt in an iron ladle.

Q.—A subscriber asks for a solution for electrodeposition of bright 14kt. gold on watch cases.

A.—It is impossible in the space available here to describe in detail the electrodeposition of 14kt. gold from solutions used for this purpose. This operation, as well as all the rest of the gold plating, demands considerable skill and experience in order to get the best results. The choice of solutions depends altogether upon the amount of plating desired and the uses for which the articles are intended. A solution which is used a great deal for cheap work, and in which the articles are plated in one application, is composed of chloride of gold, cyanide of potassium and carbonate of soda. The chloride of gold is prepared by dissolving, say 10 dwt. of fine gold in aqua regia (one part nitric and two parts hydrochloric acid, which must be chemically pure), and evaporating the solution to dryness, using gentle heat. The residue thus obtained is dissolved in warm water and filtered, after which it is dissolved in a gallon of distilled water. Chemically pure cyanide of potassium is then added, while constantly stirring the solution, the cyanide being added gradually in small amounts until the solution loses its color; $1\frac{1}{2}$ ounce of carbonate of soda is then added to the solution. An anode consisting of 10 parts of fine gold and 8 parts of oreide has to be used, and the plating is started after the above solution has been heated to about 130 degrees Fahrenheit. While the plating goes on a solution of carbonate of copper is gradually added until the desired shade of the deposit is obtained. The carbonate of copper solution is made by dissolving one-half ounce of carbonate of copper in a little water and ammonia, and slowly adding cyanide of potassium while shaking the solution until the copper carbonate is dissolved. Work to go into this solution should be highly polished. Being intended for cheap goods only, of course the wearing qualities of the articles produced do not enter into consideration.

Q.—A brass founder refers to the analysis of phosphor bronze "B" in the October issue of THE METAL INDUSTRY, which was given as copper 89.75 per cent., tin 10 per cent. and phosphorus 0.25 per cent. The alloy contains no zinc. He asks whether zinc is not necessary or whether the ordinary 2 per cent. that is put into gun metal will do harm.

A.—This particular alloy, as shown by the analysis, contains no zinc, and the latter is, as a rule, not present in phosphor bronze. A very small amount of phosphor-tin added to gun metal of the usual 88-10-2 mixture, will exert a beneficial influence by reducing the oxide. Care has to be taken that too much is not added, and whatever amount is added should replace an equivalent weight of tin.

Q.—A plater advises that he has trouble in nickel plating hollow ware about $2\frac{1}{2}$ inches deep, on the inside. His solution works nice and white on flat ware.

A.—It is hard to deposit nickel in a satisfactory manner upon the inside of articles with the ordinary plating solution, as it is not rich enough in nickel. Better results might be obtained by increasing the conductivity of the solution by making it more concentrated, that is, richer in nickel. It is, however, necessary to look out that the solution does not become too concentrated, in which case the deposit is apt to be dark. Another alternative,

especially when the quantity of hollow ware to be plated does not warrant the expense of making up a specially concentrated solution, is to have recourse to small auxiliary anodes. The latter are arranged within the depressed part of the article and must not come too near the surface to be plated.

READERS' OPINIONS.

Correspondence is solicited from all of our readers on subjects relating to the founding, finishing, rolling and plating of the non-ferrous metals and alloys. Name and address must be given, though not necessarily for publication. Address **THE METAL INDUSTRY**, 61 Beekman street, New York.

BLACK NICKEL SOLUTION.

To the Editor of **THE METAL INDUSTRY**:

I note one of your correspondents has trouble with his black nickel solution. I used one similar to your suggestion for a number of years, consisting of arsenic, nickel and cyanide. I experienced, however, always more or less trouble with it, and I therefore discarded it and used another one, which I make up as follows: I take any quantity of good conducting nickel solution, neutralize it carefully with ammonia and then add 2 to 3 ozs. of sulphocyanide of potash to the gallon. This solution works exactly as a nickel solution with nickel anodes, but works with a very low current. The results are very good, and, if the solution is once used, the old way of making and using a black nickel solution would soon be discarded.

C. H. PROCTOR.

NEW PLATING TUMBLING BARREL.



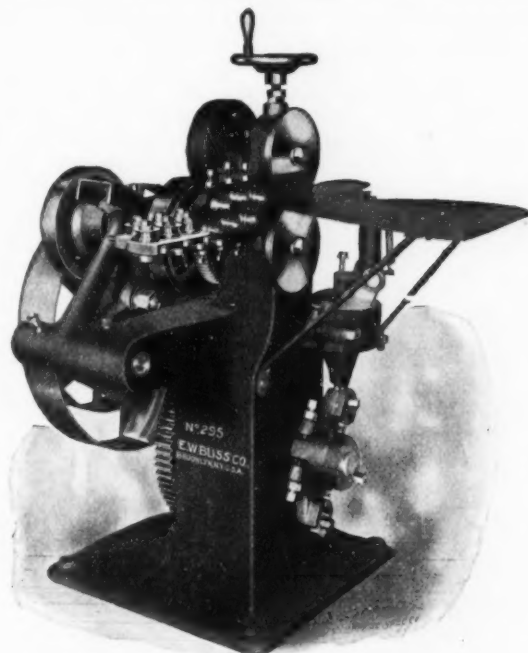
Something new in plating apparatus is the "Reliance Plating Tumbling Barrel" shown in cut. Though platers' tumbling barrels have been on the market for a number of years, this barrel has some new features, as it is claimed to be the first one in which the barrel anodes are attached to the barrel. Heretofore they have been suspended into the solution from the outside. The barrel tumbles and plates the work in the same operation, and it is especially suitable for the plating of small work, such as screws. The

work rests on a copper plate at the bottom of the barrel and the anodes are of curved shape and are placed between the barrel and an inner rattan circle. It is said the use of the barrel will save time, labor and material. It is manufactured by Chas. F. L'Hommedieu, 48 South Clinton Street, Chicago, Ill.

The National Foundrymen's Association met at Cincinnati, Ohio, November 15th, and after transacting business many members adjourned to St. Louis, where on November 19th and 20th they visited the Fair. The party was first in charge of Mr. F. Swedtmann, of St. Louis, and afterwards Mr. Kingsland, of the Central Brass Company, of the same city. Dr. Day, of the U. S. Geological Survey, and Dr. Moldenke, of the American Foundrymen's Association, piloted the party to the various exhibits of interest. The foundrymen were favored with special passes to the Philippine Exposition, and spent a very entertaining afternoon with the little brown men of the Far East.

A NEW BLISS WIRE RING FORMING MACHINE.

A wire ring forming machine of new design has recently been developed by the E. W. Bliss Company, Brooklyn, N. Y. This is known as No. 295 continuous wire ring machine and is shown in the half-tone engraving. It is entirely automatic in its action and may be easily adjusted to produce rings of different diameters and of varying sizes of wire. The construction is heavy and durable, as is indicated by the illustration. The machine is double acting in the sense that it forms a ring at each forward and back-



ward stroke of sector gear, or each half revolution, thus having double the capacity of a single acting machine. The wire is fed to the machine continuously from a reel, and the process consists of first straightening it, forming the ring and cutting off the required length. The normal range of the machine's work includes making of rings of wire from 4 to 28" in diameter in stock up to 9-32" in size.

John A. Walker, vice-president of the Joseph Dixon Crucible Company, of Jersey City, N. J., has returned from his eighth voyage to Europe. Mr. Walker's trip was purely a business one, but he managed to do some sightseeing and have a good time.

Robert H. Swayze, who was for twenty years in charge of the New York branch of the Plume & Atwood Manufacturing Company, Waterbury, Conn., died November 5th at his home, in Bound Brook, N. J., age 64 years.

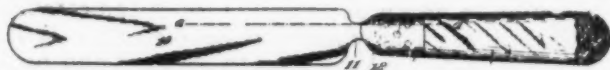
THE METAL INDUSTRY recently had the pleasure of a call from Mr. S. Vaughan Morgan, one of the proprietors of *The Ironmonger*, of London. Mr. Morgan was on his way to England after a six months' visit to the United States, Canada and Mexico.

Owing to a typographical error in our November issue, the name of the manufacturer in the article on "Russian Antiques in Brass and Copper" was Joseph Weintraub, when it should have been Jacob Weintraub, whose office and factory is at 197 Grand street, New York.

PATENTS

A full copy of any Patent mentioned will be furnished for Ten Cents. Address THE METAL INDUSTRY, 61 Beekman Street, New York

769,220. Sept. 6, 1904. FASTENING FOR KNIFE-HANDLES. George W. Hodges, Morgan Park, Ill., and Glover S. Hastings, Plainville, Conn.—A handle, a thimble, a blade, said handle having at its blade end a reduced portion, said reduced portion pro-



vided with laterally-projecting protuberances adapted to contact with the inner wall of the thimble and means interlocking said handle, thimble and blade.

769,250. Sept. 6, 1904. ELECTRIC FURNACE. Michael R. Conley, New York, N. Y., assignor to Electric Furnace Company, New York, N. Y., a corporation of New York.—In an electric furnace, the combination with the receptacle having its walls formed of a resisting medium adapted to become incandescent on the passage of an electric current through it, of a plural series of arms of greater electrical conductivity than the said furnace, the



several series being arranged in different planes to the end that the current may be passed through one or more series as desired to vary the electrical distribution in the furnace.

770,139. Sept. 13, 1904. BATTERY-PLATE MOLD. Albert C. Wood and James A. McMullan, Philadelphia, Pa.—A holder for supporting strips of lead edgewise, having a solid back or base



portion and a grooved face in which the strips are placed, the back portion extending laterally beyond the open ends of the grooves formed in the face thereof, substantially as set forth.

772,712. Oct. 18, 1904. MOLD FOR MAKING BRASS CASTINGS. Frank J. Friese and John E. Gilbert, St. Louis. A metallic mold for making brass castings which contains iron and aluminum, the aluminum being intimately mixed with the iron throughout the mold.

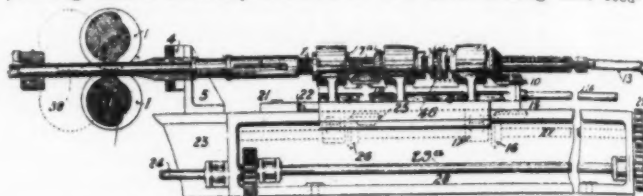
772,720. Oct. 18, 1904. SKIM-GATE FOR MOLDS. August Ludwig, Milwaukee.—In a skim-gate for molds, a mold-flask having a shouldered channel in its drag, a core seated upon the shoulders of the channel, and provided with downwardly-flaring perforations therethrough, a gate in the drag extending from the channel around the edge of the perforated core to the matrix of the mold, a skim-gate formed in the cope directly above the perforated core, a flange depending from the upper wall of said skim-gate above the perforations of the core, and an ingate connecting with said skim-gate.

775,170. Nov. 15, 1904. PROCESS OF REPAIRING CASTINGS OR THE LIKE. James H. Gravell, Philadelphia.—The process of repairing castings, which consists in heating the part to be repaired, establishing an arc between said part and an electrode of substantially the same metal as the casting, thereby fusing a portion of the electrode and uniting it to the casting and permitting the casting and applied metal to cool gradually.

775,060. Nov. 15, 1904. PROCESS OF REDUCING ALUMINUM OR OTHER METALS. Henry S. Blackmore, Mount Vernon, N. Y.—The process of reducing aluminum which consists in fusing an oxy compound of metal having greater affinity for oxygen than aluminum, adding thereto aluminum oxide and subjecting the mass to the action of an electrolytic current capable of liberating the aluminum and replenishing the bath with aluminum oxide

from time to time as the aluminum is liberated and the bath becomes depleted thereof by reduction.

774,087. Oct. 25, 1904. AUTOMATIC MECHANISM FOR USE IN STEP-BY-STEP ROLLING OF METAL TUBES. Richard Laybourne, Charles W. E. Marsh and Benjamin Price, Newport, England.—In apparatus for rolling or swaging metal tubes from hollow ingots step by step and having a feedscrew and mandrel adapted to intermittently advance and rotate the work-piece on said mandrel; the combination with such feed-screw and mandrel of a yielding clutch shiftably secured to and surrounding said feed-



screw and adapted to be intermittently and automatically thrown out of gear with said feed-screw each time the rolls grip the work-piece and thereby prevent the rotation and advance of the feed-screw and mandrel while the work-piece is thus gripped, means for automatically forcing the yielding part of said clutch into gear with a constantly-rotating part of said clutch when the work-piece mandrel and feed-screw are liberated by the rolls, and means to constantly rotate said rotating clutch part for the purpose of advancing and turning the feed-screw mandrel and work-piece thereon for a suitable distance when the latter is released from the rolls to thereby expose a fresh part of the work-piece to the action of the rolls.

775,022. Nov. 15, 1904. APPARATUS FOR REDUCING METAL BARS TO SHEETS IN PILE IN A HEATED STATE. Thomas V. Allis, Bridgeport, Conn.—In a combination with roughing-rolls adapted to reduce bars in a heated state into plates, a "roll-conveyor" leading from the roughing-rolls to a heating furnace, and adapted to deliver the plates to said furnace at a plane above that of the roughing-rolls, a heating furnace provided with a throat or inlet opening in alignment with the roll-conveyor, an inclined plate support having vertical stops for automatically registering successive plates into a "pile" and an exit door through which said pile may be removed.

CHANGE IN BRITISH PATENT LAW.

(From United States Consul Mahin, Nottingham, England.)

American investors who intend taking out patents in Great Britain will be interested in the following act of Parliament, which takes effect January 1, 1905, and which changes certain provisions of the existing patent law:

"Where an application for a patent has been made, and a complete specification has been deposited by the applicant, the examiner shall, in addition to the inquiries which he is directed to make by the patents, designs, and trade-marks act of 1883, make investigation for the purpose of ascertaining whether the invention claimed has been wholly or in part claimed or described in any specification (other than a provisional specification not followed by a complete specification) published before the date of the application and deposited pursuant to any application for a patent made in the United Kingdom within fifty years before the date of the application.

"If as the result of this official search it appears that the invention sought to be patented has been wholly or in part claimed or described in any such specification the applicant will be informed, and will have the opportunity of amending his specifications so as to confine it to so much of his supposed invention as he may desire to patent in view of the specification to which his attention has been called by the comptroller of patents.

"The sections of the patents, designs, and trade-marks act which regulate the time for depositing a complete specification shall have effect as if references therein to the period of nine months were references to the period of six months."

TRADE NEWS

Trade News of Interest Desired from All of our Readers. Address THE METAL INDUSTRY, 61 Beekman St., New York.

During the month of November the Dings Electro Magnetic Separator Company shipped seven of their machines.

The Liberty Brass Foundry, of Buffalo, N. Y., recently cast a bronze tablet measuring $3\frac{1}{2} \times 5$ feet and weighing 493 pounds.

The Genesee Metal Works, of Rochester, N. Y., report a specially good year. They have contracts on hand for a large supply of metal.

The Acorn Brass Works, of Chicago, Ill., are running day and night in order to keep abreast of their orders for various kinds of brass work.

The Otto Gas Engine Works, Philadelphia, Pa., have bought sixty acres of land in Wilmington, Del., and next spring will begin the erection of new shops.

The Carborundum Company, of Niagara Falls, N. Y., have put up an addition to their factory, which when equipped will greatly increase their capacity.

Spot cash is offered by John C. Culbert, 22 Beech street, Pawtucket, R. I., for brass sweepings of every description. Also lead dross, solder dross and tin dross.

There is talk in aluminum circles about another conference of the comb manufacturers to formulate an agreement on prices. Nothing of importance has been done as yet.

Arthur T. Rutter & Co., 256 Broadway, New York, have issued some attractive pamphlets on the sheet, rod, wire and tubing that they sell in the non-ferrous metals and alloys.

The Montpelier Cup and Metal Works, of Montpelier, Ind., report that they have had several good offers of manufacturing sites, but have not yet decided to move elsewhere.

A conspicuous sight alongside the Chicago railroads entering St. Louis are great sign boards announcing that this is the site of the new plant of the Hoyt Metal Company—thirty acres.

C. J. Hussey & Co., Pittsburg, Pa., rollers of sheet copper, issue a monthly stock list showing the quantity of sheet in their warehouse in the different sizes, thicknesses and kinds.

The R. B. Seidel Black Lead Crucible Works, Philadelphia, Pa., report that business has picked up considerable and that they now have a very good trade in their regular line of crucibles.

The plant of the Mersereau Metal Bed Company, of Jersey City, N. J., was damaged recently by fire, but is in full operation again. The company manufacture fifty patterns of brass bedsteads.

The Kitts Manufacturing Company, Oswego, N. Y., have been recently incorporated with a capital of \$10,000. Their business will be under new management and they will manufacture steam specialties.

The gold medal and special diploma has been awarded to the Mietz & Weiss oil engine at the Louisiana Purchase Exposition at St. Louis. This makes the fifth gold medal this company has received from expositions since 1897.

The McCullough-Dalzell Crucible Company, Pittsburg, Pa., have just completed the erection of a new dry house built in the most modern fashion. Natural gas is used as fuel, as elsewhere in the works.

The American Nickeloid and Manufacturing Company, of Peru, Ill., have issued new price lists on sheet nickeloid, copperoid, brassoid and zinc, and also on nickeloid tubing and their yellow bronze belt lacing.

German silver and phosphor bronze in the form of ingot, sheet, rods and wire, also jewelers' bar alloys and shot copper, are manufactured by the Riverside Metal Company, Riverside, Burlington County, N. J.

Illustrated catalogue and price list No. 2 has just been issued by the Parker Wire Goods Company, Worcester, Mass. The catalogue relates to their various wire goods, of which they manufacture considerable variety.

The Diamond Saw and Stamping Works, of Buffalo, N. Y., have just issued several pamphlets relating to their hack saw blades for hand use and power machines, also describing their adjustable hack saw frames.

Michael Hayman & Co., of Buffalo, N. Y., have let the contracts for their new smelting works, which are to be located in the northeastern part of the city, alongside of the tracks of the New York Central Railroad.

S. C. Rogers & Co., Buffalo, N. Y., manufacturers of metal working machinery, have moved back to their old quarters at 8 Lock street. A few months ago they had to seek temporary quarters on account of a fire.

The Manitowoc Aluminum Novelty Company, of Manitowoc, Wis., report that business is very good and that they are adding many new novelties to their line. Their new goods will be ready for the trade by the first of the year.

The Haines, Jones & Cadbury Company, of Philadelphia, Pa., are sending out a circular containing engravings of their show rooms. The company maintain an exposition of their own to display all kinds of plumbers' fixtures.

Benj. Middleditch, a manufacturer of brass founders' and finishers' machinery and flasks at Detroit, Mich., is now settled in his new plant at 97 Meldrum avenue, where he has a three-story building 50 x 100 equipped with the latest machines and tools.

N. Deutsch & Co., of Chicago, Ill., smelters of brass and copper, report that their export trade for the last three months has been as heavy as the six months previous. They are receiving a large number of inquiries and think of enlarging their plant.

The Wellman-Seaver-Morgan Company, Cleveland, O., have been awarded a contract to manufacture and erect for the Fresno Copper Company, Limited, of England, a complete copper smelting and refining plant, which will be located at Fresno County, Cal.

The International Acheson Graphite Company, of Niagara Falls, N. Y., have moved into their handsome new office building on the opposite side of the railroad tracks from their plant. The company report that they are making progress with their siloxicon products.

The Bruce Company, of Cleveland, Ohio, have moved into their new offices at 8 Columbus street. Their foundry and machine shop has been equipped with modern machine tools and they will manufacture presses, dies, stamping machinery, gas and gasoline engines.

The Damascus Bronze Company, of Pittsburg, Pa., have moved in their new plant which adjoins their old works at South and Sturgeon streets, Allegheny. The new plant has the latest equipment, and with this enlargement the Bronze Company doubles their capacity.

The Electric Smelting and Aluminum Company, of Lockport, N. Y., manufacture a high grade of manganese copper which is specially suitable for the manufacturer of manganese bronze. The Ajax Metal Company, of Philadelphia, Pa., are the selling agents for this alloy.

The S. Obermayer Company, Cincinnati, O., manufacturers of foundry facings and foundry supplies, have secured a contract from the United States Navy Yards, New York and Cavite, P. I., for foundry facings and foundry supplies to be used during the coming year at both of these yards.

"What I Do" is the expression on the title leaf of a neat pamphlet issued by F. B. Stevens, a manufacturer and dealer in polishers' and platers' supplies at Larned and Third streets, Detroit, Mich. Besides illustrating Mr. Stevens' goods, the pamphlet contains information on polishing and plating.

The Western Brass Manufacturing Works, of Chicago, Ill., have moved into their new factory, 47 North Elizabeth street, and are now in shape to execute promptly orders for hardware in brass, bronze and iron. They report that their new factory is thoroughly equipped with up-to-date machinery.

A fire at the Aldene (N. J.) plant of the Watson-Stillman Company of New York burned the floors and the roof of their main machinery building. The damage has been repaired. The Watson-Stillman Company have just issued circulars relating to "Jackohol," an improved liquid for hydraulic jacks.

Estey Brothers' Company, of Brooklyn, N. Y., have been incorporated with a capital of \$10,000 to manufacture and deal in metal goods, etc. The incorporators and directors are: Samuel R. Estey, G. Howard Estey and Edward M. Bowman, all of Brooklyn. The company are manufacturers of wire, iron and brass work, and have a New York office and a factory in Brooklyn.

The Roberts Chemical Company, Niagara Falls, N. Y., report a good business. They recently shipped two tons of caustic potash to a brass manufacturer for cleaning purposes. The company's product is put up in drums of all sizes to meet the requirements of the smallest to the largest shop of the plater and brass goods manufacturer.

The Sherwood Manufacturing Company, of Buffalo, N. Y., are now settled in their new plant, located alongside the New York Central Railroad. Their building and equipment is of the latest and best construction obtainable, and in their foundry they use a Rockwell furnace entirely for melting all of their metal. They manufacture brass goods.

The new copper refinery of The Tacoma Smelting Company, Tacoma, Wash., will have a capacity of 25 to 30 tons of cathodes per day. It will be equipped with a 3-ton electric crane with 60 feet span and a Walker casting machine for casting wire bars and ingots. The Westinghouse Electric and Manufacturing Company will furnish the two direct connected motor generator sets.

The stock on hand and the equity of the Housatonic Manufacturing Company, of New Haven, Conn., have been bought by

W. S. Burn, representing New York interests. The new organization will continue the manufacture of tinned steel spoons, knives, forks, electric holders and screw caps, and later on will take a new name and add some new staple lines to the business.

The J. W. Paxson Company, of Philadelphia, Pa., manufacturers of foundry supplies, announce that they have made up a special line of crucible, pick-up and shaking-out tongs and carry the standard sizes in stock. Special sizes are made to order. The company have just issued catalogue No. 11 relating to brass foundry equipment and supplies and which is of interest to every brass founder.

The John Porteous Manufacturing Company, of Cincinnati, Ohio, report that they have sold 24 furnaces since putting their new portable furnace on the market and have orders for 20 more. In their own smelting works they have six in operation and melt 30,000 pounds of metal a day in the form of ingots and castings. The company have one of the largest and most complete smelting plants in the Middle West.

The new plant of the Ansonia Copper and Iron Works is nearing completion alongside the C. H. & D. Railroad, Cincinnati, Ohio. The works will be 196 x 186 feet and employ 150 men. It will be equipped with an electric traveling crane and the latest types of steam hammers. The company does all kinds of heavy brass and sheet copper work, and its new shop will enable it to do this work under much more favorable conditions.

The International Steam Pump Company, New York city, are sending out a card containing a map showing the location of the new and old Worthington Hydraulic Works, at Harrison, N. J., and Brooklyn, N. Y. The card also contains a short description of the new Worthington Works, of Harrison, which have 18 acres of floor space and can employ 6,000 workmen. It is the largest industrial plant near New York and cost \$2,000,000.

A new use of aluminum has recently been tried by McKenna Brothers Brass Company, of Pittsburg, Pa., who have made several bowling balls of the light metal. The balls were $\frac{7}{8}$ of an inch thick, 27 inches in circumference and weighed 16 $\frac{1}{2}$ pounds, the standard weight. Steel tubing was inserted at the finger holes. The advantage claimed for an aluminum ball is that it will not wharp like a wooden one and that it is less expensive than hard rubber.

The brass foundry of Clum & Atkinson, Rochester, N. Y., are able to execute heavy brass casting so promptly that they receive orders from New York city for special marine work. They recently made two castings of shaft liners—one 1,800 pounds, the other 1,300—and when finished they were sent by express to New York, the parties being in such a hurry for them. Clum & Atkinson's foundry is especially fitted for the manufacture of heavy brass castings.

The Falkenau-Sinclair Machine Company, of 109 North Twenty-second street, Philadelphia, Pa., announce that they are retiring from business and have offered their plant for sale. They will sell the whole plant or the different departments of the business, as desired. These include a line of power presses which the company have spent ten years in introducing, a line of testing machines, some special hydraulic presses and valves and some special machines, such as a duplex keyway milling machine, traveling head shaper, etc. The company report that they have a finely equipped shop and well located, the building being a three-story brick structure 60 x 90 feet. It has a boiler and engine, sprinkler, heating and telephone systems.

WANTED: TWO FIRST-CLASS BRASS MOLDERS accustomed to general jobbing work. No strike, open shop, nine-hour day, good wages to competent men. In replying give references, state experience and salary expected. Address Brass Molder, care of THE METAL INDUSTRY.

Metal Prices, December 7, 1904

METALS

TIN—Duty Free.	Price per lb.
Straits of Malacca.....	29.65
COPPER, PIG, BAR AND INGOT AND OLD COPPER—	
Duty Free. Manufactured 2½c. per lb.	
Lake	15.40
Electrolytic	15.25
Casting	15.00
SPELTER—Duty 1c. per lb.	
Western	5.90
LEAD—Duty Pigs, Bars and Old 2½c. per lb.; pipe	
and sheets 2½c. per lb.	
Pig Lead	4.75
ALUMINUM—Duty Crude, 8c. per lb. Plates, sheets,	
bars and rods 13c. per lb.	
Small lots	37.00
100 lb. lots.....	35.00
1,000 lb. lots.....	34.00
Ton lots	33.00
ANTIMONY—Duty ¾c. per lb.	
Cooksons	9.75
Hallets	9.50
Other	9.25
NICKEL—Duty 6c. per lb.	
Large lots	40 to 50
Small lots	50 to 75
BISMUTH—Duty Free.....	\$1.50 to \$2.00
PHOSPHORUS—Duty 18c. per lb.	
Large lots	45
Small lots	65 to 75

Price per oz.

SILVER—Duty Free—Commercial Bars.....	\$0.61
PLATINUM—Duty Free	19.00
GOLD—Duty Free	20.00
QUICKSILVER—Duty 7c. per lb. Price per Flask.	42.00

Zinc—Duty, Sheet, 2c. per lb. 600-lb. casks, 7.50 per lb., open, 8.00 per lb.

Tobin Bronze—Rods, Unfinished, 19c.

Tobin Bronze—Rods, Finished, 20c.

PRICE FOR ALUMINUM BRONZE INGOTS.

	Per pound.
2½ per cent.....	19c.
5 per cent.....	19½c.
7½ per cent.....	20½c.
10 per cent.....	21½c.

Manganese Bronze, Ingots.....	16½c.
Phosphor Bronze, Ingots.....	15 to 18c.
Silicon-Copper, Ingots	34 to 36c.

OLD METALS

	Buying.	Selling.
Heavy Cut Copper.....	13.25c.	14.00c.
Copper Wire	12.75c.	13.25c.
Light Copper	11.75c.	12.50c.
Heavy Mach. Comp.....	11.25c.	12.00c.
Heavy Brass	8.25c.	8.75c.
Light Brass	6.75c.	7.25c.
No. 1 Yellow Brass Turnings...	8.50c.	9.00c.
No. 1 Comp. Turnings.....	10.00c.	10.50c.
Heavy Lead	4.25c.	4.50c.
Zinc Scrap	4.00c.	4.50c.
Scrap Aluminum, sheet, pure...	22.00c.	25.00c.
Scrap Aluminum, cast, alloyed..	16.00c.	20.00c.
Old Nickel	15.00c.	25.00c.
No. 1 Pewter.....	20.00c.	21.00c.

PRICES OF SHEET COPPER

SIZES OF SHEETS.		96oz. & over 75 lb. sheet 30x90 and heavier	64oz. to 96oz. 50 to 75 lb. sheet 30x90	32oz. to 64oz. 25 to 50 lb. sheet 30x90	24oz. to 32oz. 18½ to 25 lb. sheet 30x90	16oz. to 24oz. 12½ to 18½ lb. sheet 30x90	14oz. and 15oz. 11 to 12½ lb. sheet 30x90
CENTS PER POUND.							
Not wider than 30 ins.	Not longer than 72 ins.	18	19	19	19	19	20
	Longer than 72 ins. Not longer than 96 ins.	18	19	19	19	19	20
	Longer than 96 ins.	18	19	19	19	19	21
Wider than 30 ins. but not wider than 36 ins.	Not longer than 72 ins.	18	19	19	19	19	21
	Longer than 72 ins. Not longer than 96 ins.	18	19	19	19	19	21
	Longer than 96 ins. Not longer than 120 ins.	18	19	19	19	20	22
	Longer than 120 ins.	18	19	19	20	21	
Wider than 36 ins. but not wider than 48 ins.	Not longer than 72 ins.	18	19	19	20	21	23
	Longer than 72 ins. Not longer than 96 ins.	18	19	19	20	22	24
	Longer than 96 ins. Not longer than 120 ins.	18	19	19	21	23	27
	Longer than 120 ins.	18	19	20	22	25	
Wider than 48 ins. but not wider than 60 ins.	Not longer than 72 ins.	18	19	19	20	22	25
	Longer than 72 ins. Not longer than 96 ins.	18	19	19	21	23	28
	Longer than 96 ins. Not longer than 120 ins.	18	19	20	22	25	
	Longer than 120 ins.	19	20	21	23	27	
Wider than 60 ins. but not wider than 72 ins.	Not longer than 96 ins.	18	19	20	22	27	
	Longer than 96 ins. Not longer than 120 ins.	18	19	21	24	29	
	Longer than 120 ins.	19	20	22	27		
Wider than 72 ins. but not wider than 108 ins.	Not longer than 96 ins.	19	20	22	25		
	Longer than 96 ins. Not longer than 120 ins.	20	21	23	26		
	Longer than 120 ins.	21	22	24	28		
Wider than 108 ins.	Not longer than 132 ins.	22	23	25			
	Longer than 132 ins.	23	24	27			

Rolled Round Copper, ¾ inch diameter or over, 21 cents per pound. (Cold Drawn, Square and Special Shapes, extra.)

Circles, Segments and Pattern Sheets three (3) cents per pound advance over prices of Sheet Copper required to cut them from.

All Cold or Hard Rolled Copper, 14 ounces per square foot and heavier, one (1) cent per pound over the foregoing prices.

All Cold or Hard Rolled Copper, lighter than 14 ounces per square foot, two (2) cents per pound over the foregoing prices.

Cold Rolled and Annealed Copper, Sheets and Circles, wider than 17 inches, take the same price as Cold or Hard Rolled Copper of corresponding dimensions and thickness.

All Polished Copper, 20 inches wide and under, one (1) cent per pound advance over the price for Cold Rolled Copper.

All Polished Copper, over 20 inches wide, two (2) cents per pound advance over the price for Cold Rolled Copper.

Planished Copper, one (1) cent per pound more than Polished Copper.

Cold Rolled Copper prepared suitable for polishing, same prices and extras as Polished Copper.

Tinning Sheets, on one side, 2½c. per square foot.

For tinning both sides, double the above price.

For tinning the edge of sheets, one or both sides, price shall be the same as for tinning all of one side of the specified sheet.

Metal Prices, December 7, 1904

COPPER BOTTOMS, PITS AND FLATS

Net Cash Prices.

14 oz. to square foot, and heavier, per lb.	23c.
Lighter than 10 oz.	24c.
10 oz. and up to 12 oz.	26c.
12 oz. and up to 14 oz. to square foot, per lb.	29c.
Circles less than 8 in diam., 2c. per lb. additional.	
Circles over 13 in. diam., are not classed as Copper Bottoms.	
Polished Copper Bottoms and Flats, 1c. per lb. extra.	

PRICE LIST FOR ROLL AND SHEET BRASS

Prices are for 100 lbs. or more of sheet metal in one order.
Brown & Sharpe's Gauge the Standard.

Common High Brass	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
Wider than and including	12	12	14	16	18	20	22	24	26	28
	12	14	16	18	20	22	24	26	28	30
To No. 20 inclusive..	.22	.23	.25	.27	.29	.31	.33	.36	.39	.42
Nos. 21, 22, 23 and 24	.22	.24	.26	.28	.30	.32	.34	.37	.40	.43
Nos. 25 and 26.....	.23	.24½	.27	.29	.31	.33	.35	.38	.41	.44
Nos. 27 and 28.....	.23	.25	.28	.30	.32	.34	.36	.39	.42	.45

Add ¼ cent per lb. additional for each number thinner than Nos. 28 to 38, inclusive.

Add 7 cents per lb. for sheets cut to particular lengths, not sawed, of proportionate width.

Add for polishing on one side, 40 cents per square foot; on both sides, double this price.

Brazing, Spinning and Spring Brass, 1 cent more than Common High Brass.

Extra Quality Brazing, Spinning and Spring Brass, 2 cents more than Common High Brass.

Low Brass, 4 cents per lb. more than Common High Brass.

Gilding, Rich Gold Medal and Bronze, 7 cents per lb. more than Common High Brass.

Discount from List, 30 per cent.

PRICE LIST FOR BRASS AND COPPER WIRE

BROWN & SHARPE'S GAUGE THE STANDARD.	Com. High Brass	Low Brass	Gilding Bronze and Copper
All Nos. to No. 10, Inc.	\$0.23	\$0.27	\$0.31
Above No. 10 to No. 16.	.23½	.27½	.31½
Nos. 17 and 18.	.24	.28	.32
" 19 and 20.	.25	.29	.33
No. 21.	.26	.30	.34
" 22.	.27	.31	.35
" 23.	.28	.32	.36
" 24.	.30	.34	.38

Discount, Brass Wire, 30 per cent.; Copper Wire, 40 per cent.

PRICES FOR SEAMLESS BRASS TUBING.

From 1¼ in. to 3½ in. O. D. Nos. 4 to 13 Stubs Gauge, 20c. per lb.
Seamless Copper Tubing, 23c. per lb.

For other sizes see Manufacturers' List.

PRICES FOR SEAMLESS BRASS TUBING Iron Pipe Sizes.

Iron Pipe size.....	½	¾	1	1¼	1½	1¾	2	2¼	2½	3	3½	4	4½	5
Price per lb.....	28	27	26	25	24	23	22	21	20	19	18	17	16	15

BRAZED BRASS TUBING

Brown & Sharpe's Gauge the Standard.

Plain Round Tube,	¾ in. up to 2 in.	to No. 19, inc.	Per lb
¾ in.	¾ in.	No. 19, inc.	\$0.35
1 in.	1 in.	No. 19, inc.	.36
1¼ in.	1¼ in.	No. 19, inc.	.38
1½ in.	1½ in.	No. 19, inc.	.41
1¾ in.	1¾ in.	No. 19, inc.	.44
2 in.	2 in.	No. 19, inc.	.48
2¼ in.	2¼ in.	No. 19, inc.	.52
2½ in.	2½ in.	No. 19, inc.	.55
2¾ in.	2¾ in.	No. 19, inc.	.58
3 in.	3 in.	No. 19, inc.	.61
3½ in.	3½ in.	No. 19, inc.	.65
4 in.	4 in.	No. 19, inc.	.68
4½ in.	4½ in.	No. 19, inc.	.72
5 in.	5 in.	No. 19, inc.	.75
5½ in.	5½ in.	No. 19, inc.	.78
6 in.	6 in.	No. 19, inc.	.81
6½ in.	6½ in.	No. 19, inc.	.84
7 in.	7 in.	No. 19, inc.	.87
7½ in.	7½ in.	No. 19, inc.	.90
8 in.	8 in.	No. 19, inc.	.93
8½ in.	8½ in.	No. 19, inc.	.96
9 in.	9 in.	No. 19, inc.	.99
9½ in.	9½ in.	No. 19, inc.	1.02
10 in.	10 in.	No. 19, inc.	1.05
10½ in.	10½ in.	No. 19, inc.	1.08
11 in.	11 in.	No. 19, inc.	1.11
11½ in.	11½ in.	No. 19, inc.	1.14
12 in.	12 in.	No. 19, inc.	1.17
12½ in.	12½ in.	No. 19, inc.	1.20
13 in.	13 in.	No. 19, inc.	1.23
13½ in.	13½ in.	No. 19, inc.	1.26
14 in.	14 in.	No. 19, inc.	1.29
14½ in.	14½ in.	No. 19, inc.	1.32
15 in.	15 in.	No. 19, inc.	1.35
15½ in.	15½ in.	No. 19, inc.	1.38
16 in.	16 in.	No. 19, inc.	1.41
16½ in.	16½ in.	No. 19, inc.	1.44
17 in.	17 in.	No. 19, inc.	1.47
17½ in.	17½ in.	No. 19, inc.	1.50
18 in.	18 in.	No. 19, inc.	1.53
18½ in.	18½ in.	No. 19, inc.	1.56
19 in.	19 in.	No. 19, inc.	1.59
19½ in.	19½ in.	No. 19, inc.	1.62
20 in.	20 in.	No. 19, inc.	1.65
20½ in.	20½ in.	No. 19, inc.	1.68
21 in.	21 in.	No. 19, inc.	1.71
21½ in.	21½ in.	No. 19, inc.	1.74
22 in.	22 in.	No. 19, inc.	1.77
22½ in.	22½ in.	No. 19, inc.	1.80
23 in.	23 in.	No. 19, inc.	1.83
23½ in.	23½ in.	No. 19, inc.	1.86
24 in.	24 in.	No. 19, inc.	1.89
24½ in.	24½ in.	No. 19, inc.	1.92
25 in.	25 in.	No. 19, inc.	1.95
25½ in.	25½ in.	No. 19, inc.	1.98
26 in.	26 in.	No. 19, inc.	2.01
26½ in.	26½ in.	No. 19, inc.	2.04
27 in.	27 in.	No. 19, inc.	2.07
27½ in.	27½ in.	No. 19, inc.	2.10
28 in.	28 in.	No. 19, inc.	2.13
28½ in.	28½ in.	No. 19, inc.	2.16
29 in.	29 in.	No. 19, inc.	2.19
29½ in.	29½ in.	No. 19, inc.	2.22
30 in.	30 in.	No. 19, inc.	2.25
30½ in.	30½ in.	No. 19, inc.	2.28
31 in.	31 in.	No. 19, inc.	2.31
31½ in.	31½ in.	No. 19, inc.	2.34
32 in.	32 in.	No. 19, inc.	2.37
32½ in.	32½ in.	No. 19, inc.	2.40
33 in.	33 in.	No. 19, inc.	2.43
33½ in.	33½ in.	No. 19, inc.	2.46
34 in.	34 in.	No. 19, inc.	2.49
34½ in.	34½ in.	No. 19, inc.	2.52
35 in.	35 in.	No. 19, inc.	2.55
35½ in.	35½ in.	No. 19, inc.	2.58
36 in.	36 in.	No. 19, inc.	2.61
36½ in.	36½ in.	No. 19, inc.	2.64
37 in.	37 in.	No. 19, inc.	2.67
37½ in.	37½ in.	No. 19, inc.	2.70
38 in.	38 in.	No. 19, inc.	2.73
38½ in.	38½ in.	No. 19, inc.	2.76
39 in.	39 in.	No. 19, inc.	2.79
39½ in.	39½ in.	No. 19, inc.	2.82
40 in.	40 in.	No. 19, inc.	2.85
40½ in.	40½ in.	No. 19, inc.	2.88
41 in.	41 in.	No. 19, inc.	2.91
41½ in.	41½ in.	No. 19, inc.	2.94
42 in.	42 in.	No. 19, inc.	2.97
42½ in.	42½ in.	No. 19, inc.	3.00
43 in.	43 in.	No. 19, inc.	3.03
43½ in.	43½ in.	No. 19, inc.	3.06
44 in.	44 in.	No. 19, inc.	3.09
44½ in.	44½ in.	No. 19, inc.	3.12
45 in.	45 in.	No. 19, inc.	3.15
45½ in.	45½ in.	No. 19, inc.	3.18
46 in.	46 in.	No. 19, inc.	3.21
46½ in.	46½ in.	No. 19, inc.	3.24
47 in.	47 in.	No. 19, inc.	3.27
47½ in.	47½ in.	No. 19, inc.	3.30
48 in.	48 in.	No. 19, inc.	3.33
48½ in.	48½ in.	No. 19, inc.	3.36
49 in.	49 in.	No. 19, inc.	3.39
49½ in.	49½ in.	No. 19, inc.	3.42
50 in.	50 in.	No. 19, inc.	3.45
50½ in.	50½ in.	No. 19, inc.	3.48
51 in.	51 in.	No. 19, inc.	3.51
51½ in.	51½ in.	No. 19, inc.	3.54
52 in.	52 in.	No. 19, inc.	3.57
52½ in.	52½ in.	No. 19, inc.	3.60
53 in.	53 in.	No. 19, inc.	3.63
53½ in.	53½ in.	No. 19, inc.	3.66
54 in.	54 in.	No. 19, inc.	3.69
54½ in.	54½ in.	No. 19, inc.	3.72
55 in.	55 in.	No. 19, inc.	3.75
55½ in.	55½ in.	No. 19, inc.	3.78
56 in.	56 in.	No. 19, inc.	3.81
56½ in.	56½ in.	No. 19, inc.	3.84
57 in.	57 in.	No. 19, inc.	3.87
57½ in.	57½ in.	No. 19, inc.	3.90
58 in.	58 in.	No. 19, inc.	3.93
58½ in.	58½ in.	No. 19, inc.	3.96
59 in.	59 in.	No. 19, inc.	3.99
59½ in.	59½ in.	No. 19, inc.	4.02
60 in.	60 in.	No. 19, inc.	4.05
60½ in.	60½ in.	No. 19, inc.	4.08
61 in.	61 in.	No. 19, inc.	4.11
61½ in.	61½ in.	No. 19, inc.	4.14
62 in.	62 in.	No. 19, inc.	4.17
62½ in.	62½ in.	No. 19, inc.	4.20
63 in.	63 in.	No. 19, inc.	4.23
63½ in.	63½ in.	No. 19, inc.	4.26
64 in.	64 in.	No. 19, inc.	4.29
64½ in.	64½ in.	No. 19, inc.	4.32
65 in.	65 in.	No. 19, inc.	4.35
65½ in.	65½ in.	No. 19, inc.	4.38
66 in.	66 in.	No. 19, inc.	4.41
66½ in.	66½ in.	No. 19, inc.	4.44
67 in.	67 in.	No. 19, inc.	4.47
67½ in.	67½ in.	No. 19, inc.	4.50
68 in.	68 in.	No. 19, inc.	4.53
68½ in.	68½ in.	No. 19, inc.	4.56
69 in.	69 in.	No. 19, inc.	4.59
69½ in.	69½ in.	No. 19, inc.	4.62
70 in.	70 in.	No. 19, inc.	4.65
70½ in.	70½ in.	No. 19, inc.	4.68
71 in.	71 in.	No. 19, inc.	4.71
71½ in.	71½ in.	No. 19, inc.	4.74
72 in.	72 in.	No. 19, inc.	4.77
72½ in.	72½ in.	No. 19, inc.	4.80
73 in.	73 in.	No. 19, inc.	4.83
73½ in.	73½ in.	No. 19, inc.	4.86
74 in.	74 in.	No. 19, inc.	4.89
74½ in.	74½ in.	No. 19, inc.	4.92
75 in.	75 in.	No. 19, inc.	4.95
75½ in.	75½ in.	No. 19, inc.	4.98
76 in.	76 in.	No. 19, inc.	5.01
76½ in.	76½ in.	No. 19, inc.	5.04
77 in.	77 in.	No. 19, inc.	5.07
77½ in.	77½ in.	No. 19, inc.	5.10
78 in.	78 in.	No. 19, inc.	5.13
78½ in.	78½ in.	No. 19, inc.	5.16
79 in.	79 in.	No. 19, inc.	5.19
79½ in.	79½ in.	No. 19, inc.	5.22
80 in.	80 in.	No. 19, inc.	5.25
80½ in.	80½ in.	No. 19, inc.	5.28
81 in.	81 in.	No. 19, inc.	5.31
81½ in.	81½ in.	No. 19, inc.	5.34
82 in.	82 in.	No. 19, inc.	5.37
82½ in.	82½ in.	No. 19, inc.	5.40
83 in.	83 in.	No. 19, inc.	5.43
83½ in.	83½ in.	No. 19, inc.	5.46
84 in.	84 in.	No. 19, inc.	5.49
84½ in.	84½ in.	No. 19, inc.	5.52
85 in.	85 in.	No. 19, inc.	5.55
85½ in.	85½ in.	No. 19, inc.	5.58
86 in.	86 in.	No. 19, inc.	5.61
86½ in.	86½ in.	No. 19, inc.	5.64
87 in.	87 in.	No. 19, inc.	5.67
87½ in.	87½ in.	No. 19, inc.	5.70
88 in.	88 in.	No. 19, inc.	5.73
88½ in.	88½ in.	No. 19, inc.	5.76
89 in.	89 in.	No. 19, inc.	5.79
89½ in.	89½ in.	No. 19, inc.	5.82
90 in.	90 in.	No. 19, inc.	5.85
90½ in.	90½ in.	No. 19, inc.	5.88
91 in.	91 in.	No. 19, inc.	5.91
91½ in.	91½ in.	No. 19, inc.	5.94
92 in.	92 in.	No. 19, inc.	5.97
92½ in.	92½ in.	No. 19, inc.	6.00
93 in.	93 in.	No. 19, inc.	6.03
93½ in.	93½ in.	No. 19, inc.	6.06
94 in.	94 in.	No. 19, inc.	6.09
94½ in.	94½ in.	No. 19, inc.	6.12
95 in.	95 in.	No. 19, inc.	6.15
95½ in.	95½ in.	No. 19, inc.	6.18
96 in.	96 in.	No. 19, inc.	6.21
96½ in.	96½ in.	No. 19, inc.	6.24
97 in.	97 in.	No. 19, inc.	6.27
97½ in.	97½ in.	No. 19, inc.	6.30
98 in.	98 in.	No. 19, inc.	6.33
98½ in.	98½ in.	No. 19, inc.	6.36
99 in.	99 in.	No. 19, inc.	6.39
99½ in.	99½ in.	No. 19, inc.	6.42
100 in.	100 in.	No. 19, inc.	6.45

Bronze and copper advance 3 cents. Discount 30 per cent.

PRICE LIST FOR SHEET ALUMINUM

PLATE AND SHEET PRICE LIST.—B. & S. GAUGE.														
Prices are for 50 pounds or more at a time. Less quantities, 5 cents per pound additional. Charges made for boxing.														
Wider Than, And Including...	6 in. 14 in.	14 in. 16 in.	16 in. 18 in.	18 in. 20 in.	20 in. 24 in.	24 in. 30 in.	30 in. 36 in.	36 in. 40 in.	40 in. 45 in.	45 in. 50 in.	50 in. 55 in.	55 in. 60 in.	Polishing One Side.	Sat. Fin. with Out Lacer.
No. 13 & heavier.	42	44	44	44	44	44	47	47	47	48	48	50	50	9
14	42	44	44	44	44	44	47	47	47	48	48	50	50	7
15	42	44	44	44	44	44	47	47	47	48	48	50	50	6
16	42	44	44	44	44	44	47	47	47	48	48	50	50	8
17	42	44	44	44	44	44	47	47	47	48	48	50	50	8
18	42	44	44	44	44	44	47	47	47	48	48	50	50	9
19	42	44	44	44	44	44	47	47	47	48	48	50	50	10
20	42	44	44	44	44	44	47	47	47	48	48	50	50	11
21	42	44	44	44	44	44	47	47	47	48	48	50	50	12
22	42	44	44	44	44	44	47	47	47	48	48	50	50	13
23	42	44	44	44	44	44	47	47	47	48	48	50	50	14
24	42	44	44	44	44	44	47	47	47	48	48	50	50	15
25	42	44	44	44	44	44	47	47	47	48	48	50	50	16
26	42	44	44	44	44	44	47	47	47	48	48	50	50	17
27	42	44	44	44	44	44	47	47	47	48	48	50	50	18
28	42	44	44	44	44	44	47	47	47	48	48	50	50	19
29	42	44	44	44	44	44	47	47	47	48	48	50	50	20
30	42	44	44	44	44	44	47	47	47	48	48	50	50	21
31	42	44	44	44	44	44	47	47	47	48	48	50	50	22
32	42	44	44	44	44	44	47	47	47	48	48	50	50	23
33	42	44	44	44	44	44	47	47	47	48	48	50	50	24
34	42	44	44	44	44	44	47	47	47	48	48	50	50	25
35	42	44	44	44	44	44	47	47	47	48	48	50	50	26
36	42	44	44	44	44	44	47	47	47	48	48	50	50	27
37	42	44	44	44	44	44	47	47	47	48	48	50	50	28
38	42	44	44	44	44	44	47	47	47	48	48	50	50	29
39	42	44	44	44	44	44	47	47	47	48	48	50	50	30
40	42	44	44	44	44	44	47	47	47	48	48	50	50	31
41	42	44	44	44	44	44	47	47	47	48	48	50	50	32
42	42	44	44	44	44	44	47	47	47	48	48	50	50	33
43	42	44	44	44	44	44	47	47	47	48	48	50	50	34
44	42	44	44	44	44	44	47	47	47	48	48	50	50	35
45	42	44	44	44	44	44	47	47	47	48	48	50	50	36
46	42	44	44	44	44	44	47	47	47	48	48	50	50	37
47	42	44	44	44	44	44	47	47	47	48	48	50	50	38
48	42	44	44	44	44	44	47	47	47	48	48	50	50	39
49	42	44	44	44	44	44	47	47	47	48	48	50	50	40
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51	42	44	44	44	44	44	47	47	47	48	48	50	50	42
52	42	44	44	44	44	44	47	47	47	48	48	50	50	43
53	42	44	44	44	44	44	47	47	47	48	48	50	50	44
54	42	44	44	44	44	44	47	47	47	48	48	50	50	45
55	42	44	44	44	44	44	47	47	47	48	48	50	50	46
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61	42	44	44	44	44	44	47	47	47	48	48	50	50	52
62	42	44	44	44	44	44	47	47	47	48	48	50	50	53
63	42	44	44	44	44	44	47	47	47	48	48	50	50	54
64	42	44	44	44	44	44	47	47	47	48	48	50	50	55
65	42	44	44	44	44	44	47	47	47	48	48	50	50	56
66	42	44	44	44	44	44	47	47	47	48	48	50	50	57
67	42	44	44	44	44	44	47	47	47	48	48	50	50	58
68	42	44	44	44	44	44	47	47	47	48	48	50	50	59
69	42	44	44	44	44	44	47	47	47	48	48	50	50	60
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71	42	44	44	44	44	44	47	47	47	48	48	50	50	62
72	42	44	44	44	44	44	47	47	47	48	48	50	50	63
73	42	44	44	44	44	44	47	47	47	48	48	50	50	64
74	42	44	44	44	44	44	47	47	47	48	48	50	50	65
75	42	44	44	44	44	44	47	47	47	48	48	50	50	66
76	42	44	44	44	44	44	47	47	47	48	48	50	50	67
77	42	44	44	44	44	44	47	47	47	48	48	50	50	68
78	42	44	44	44	44	44	47	47	47	48	48	50	50	69
79	42	44	44	44	44	44	47	47	47	48	48	50	50	70
80	42	44	44	44	44	44	47	47	47	48	48	50	50	71
81	42	44	44	44	44	44	47	47	47	48	48	50	50	72
82	42	44	44	44	44	44	47	47	47	48	48	50	50	73
83	42	44	44	44	44	44	47	47	47	48	48	50	50	74
84	42	44	44	44	44	44	47	47	47	48	48	50	50	75
85	42	44	44	44	44	44	47	47	47	48	48	50	50	76
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89	42	44	44	44	44	44	47	47	47	48	48	50	50	80
90	42	44	44	44	44	44	47	47	47	48	48	50	50	81
91	42	44	44	44	44	44	47	47	47	48	48	50	50	82
92	42	44	44	44	44	44	47	47	47	48	48	50	50	83
93	42	44	44	44	44	44	47	47	47	48	48	50	50	84
94	42	44	44	44	44	44	47	47	47	48	48	50	50	85
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97	42	44	44	44	44	44	47	47	47	48	48	50	50	88
98	42	44	44	44	44	44	47	47	47	48	48	50	50	89
99	42	44	44	44	44	44	47	47	47	48	48	50	50	90
100	42	44	44	44	44	44	47	47	47	48	48	50	50	91
101	42	44	44	44	44	44	47	47	47	48	48	50	50	92
102	42	44	44	44	44	44	47	47	47	48	48	50	50	93
103	42	44	44	44	44	44	47	47	47	48	48	50	50	94
104	42	44	44	44	44	44	47	47	47	48	48	50	50	95
105	42	44	44	44	44	44	47	47	47	48	48	50	50	96
106	42	44	44	44	44	44	47	47	47	48	48	50	50	97
107	42	44	44	44	44	44	47	47	47	48	48	50	50	98
108	42	44	44	44	44	44	47	47	47	48	48	50	50	99
109	42	44	44	44	44	44	47	47	47	48	48	50	50	100
110	42	44	44	44	44	44	47	47	47	48	48	50	50	101
111	42	44	44	44	44	44	47	47	47	48	48	50	50	102
112	42	44	44	44	44	44	47	47	47	48	48	50	50	103
113	42	44	44	44	44	44	47	47	47	48	48	50	50	104
114	42	44	44	44	44	44	47	47	47	48	48	50	50	105
115	42	44	44	44	44	44	47	47	47	48	48	50	50	106
116	42	44	44	44	44	44	47	47	47	48	48	50	50	107
117	42	44	44	44	44	44	47	47	47	48	48	50	50	108
118	42	44	44	44	44	44	47	47	47	48	48	50	50	109
119	42	44	44	44	44	44	47	47	47	48	48	50	50	110
120	42	44	44	44	44	44	47	47	47	48	48	50	50	111
121	42	44	44	44	44	44	47	47	47	48	48	50	50	112
122	42	44	44	44	44	44	47	47	47	48	48	50	50	113
123	42	44	44	44	44	44	47	47	47					

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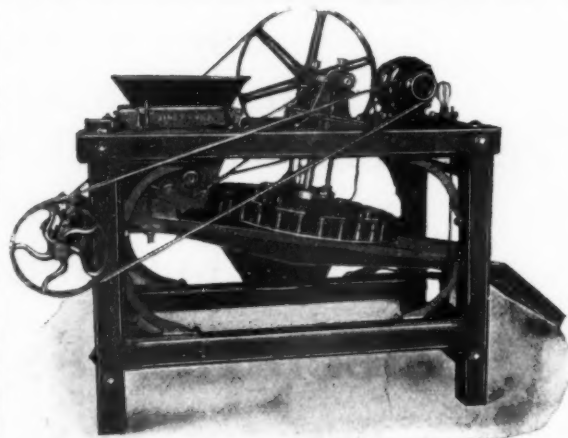
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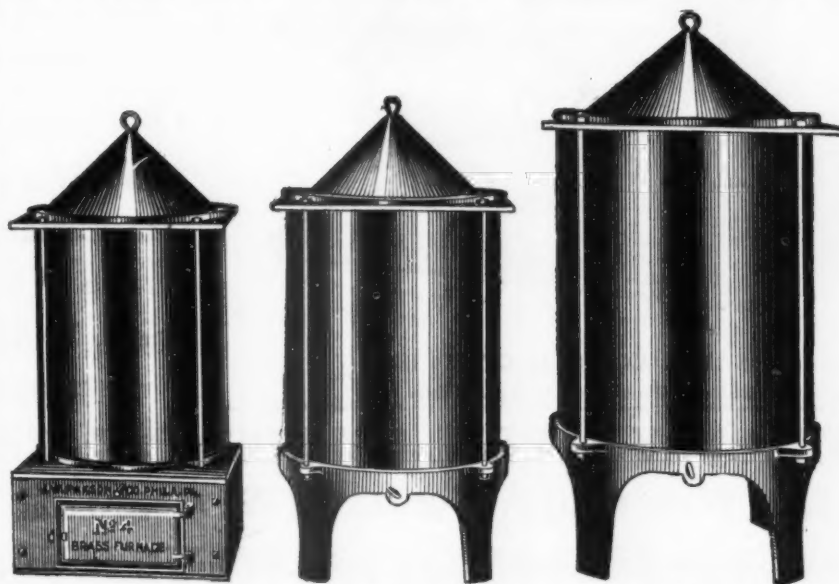


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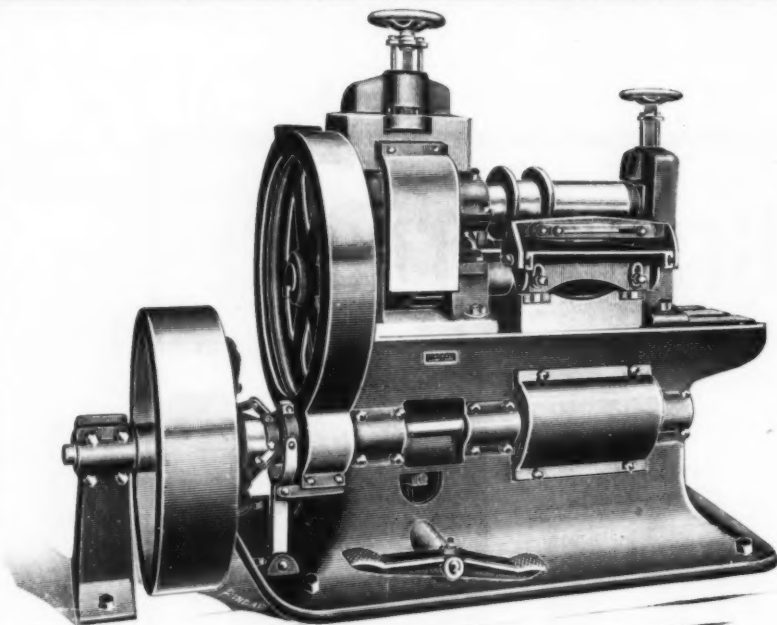
No. 7
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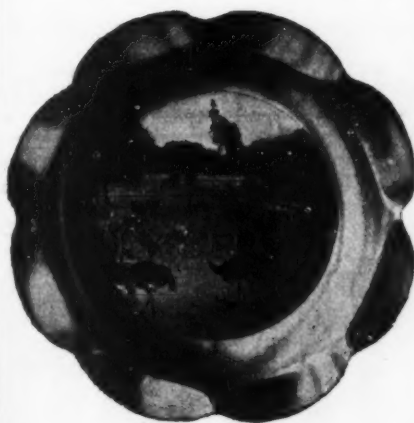
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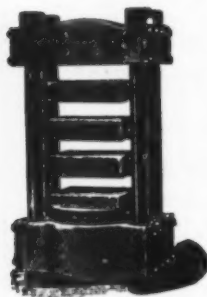
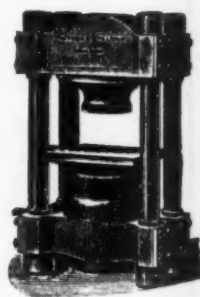


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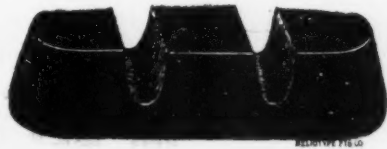
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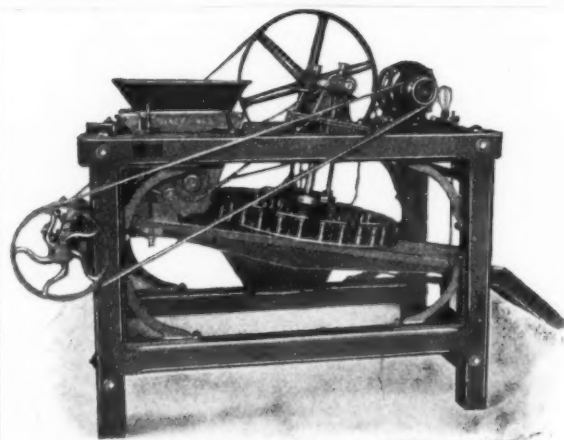
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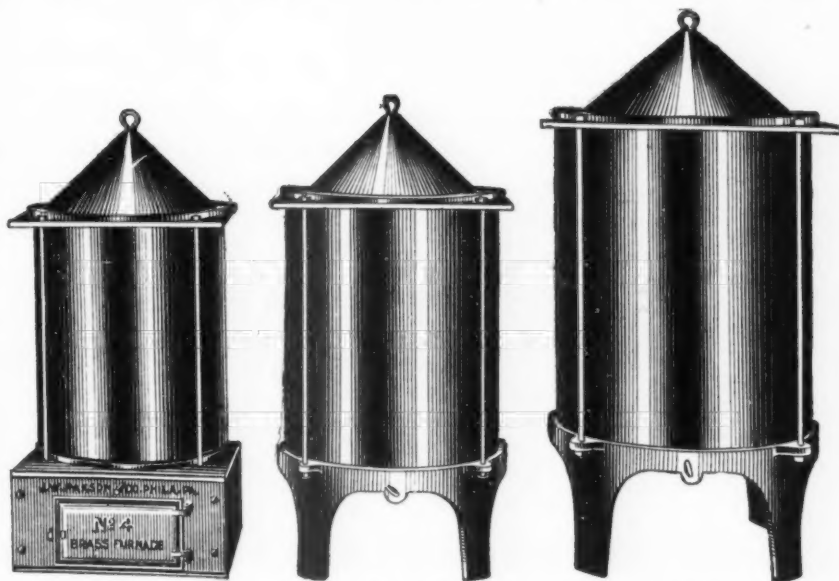


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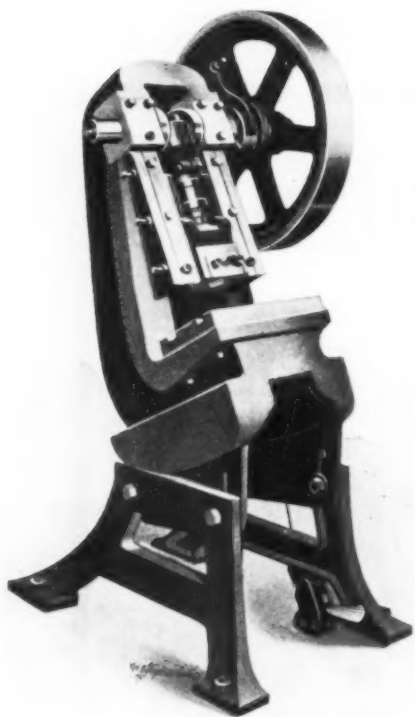
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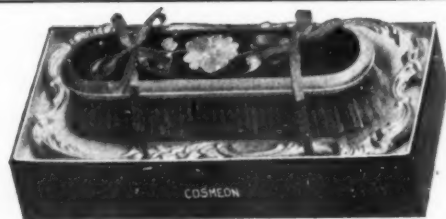
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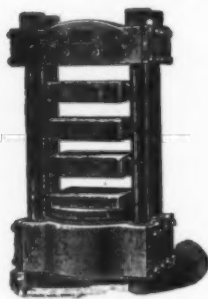
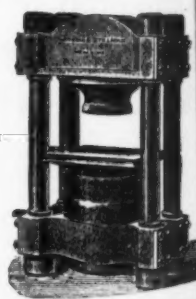
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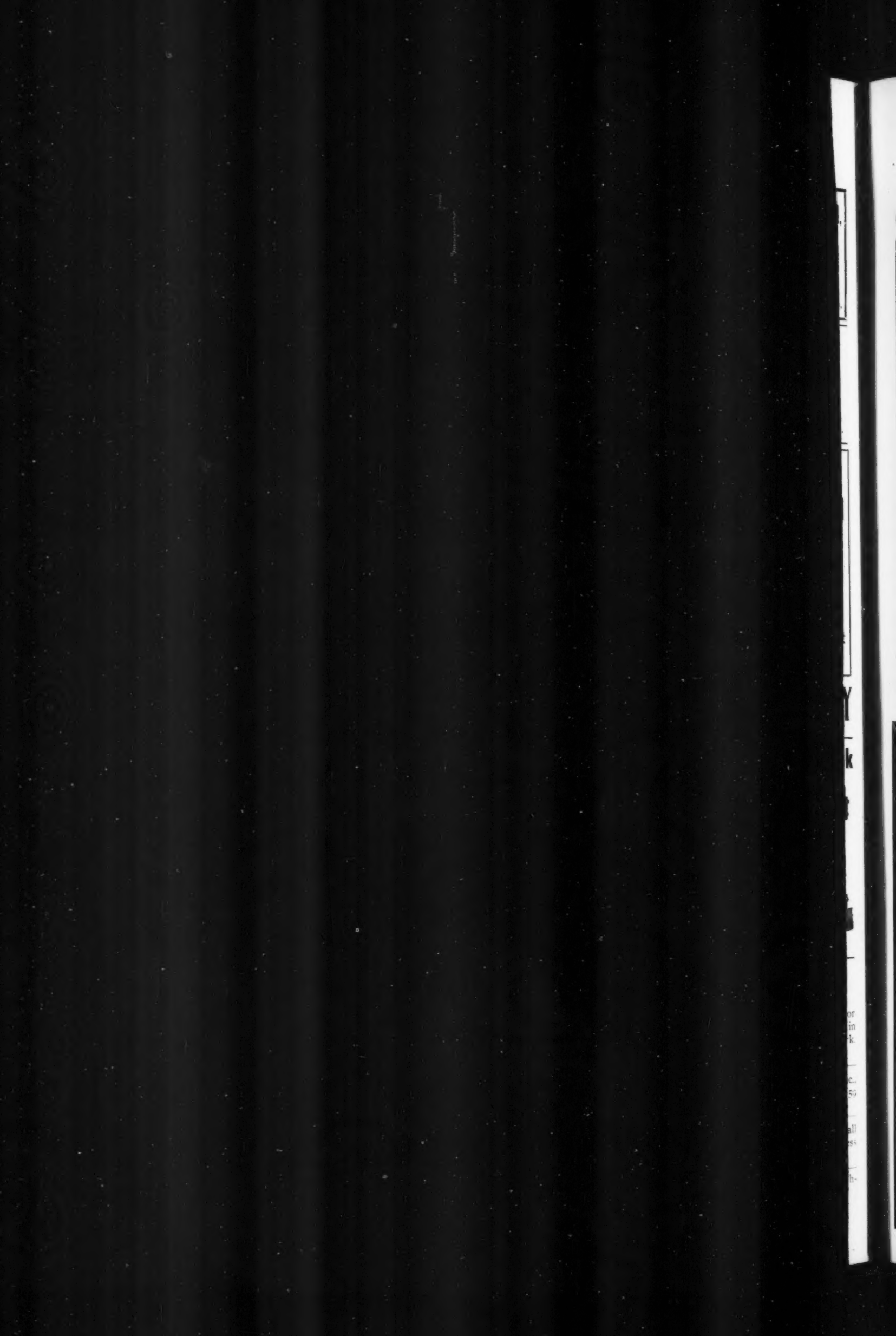
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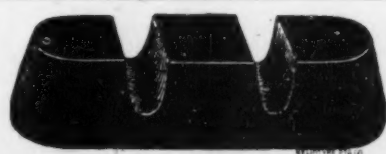
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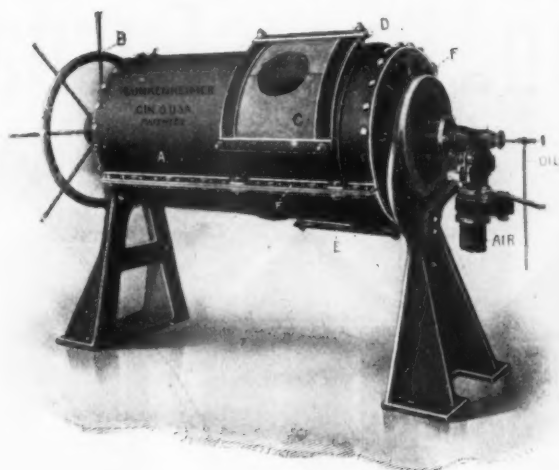
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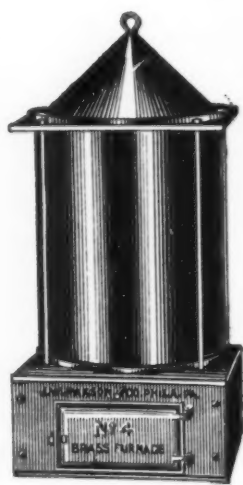
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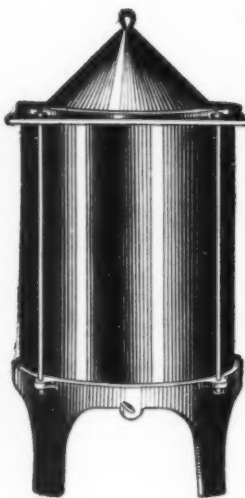
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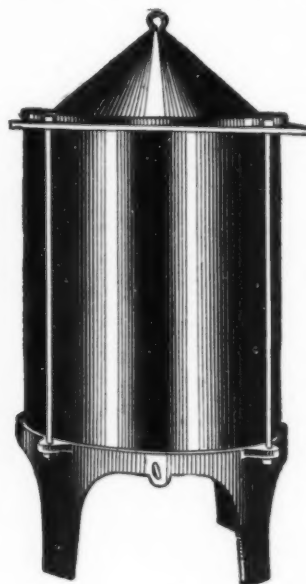
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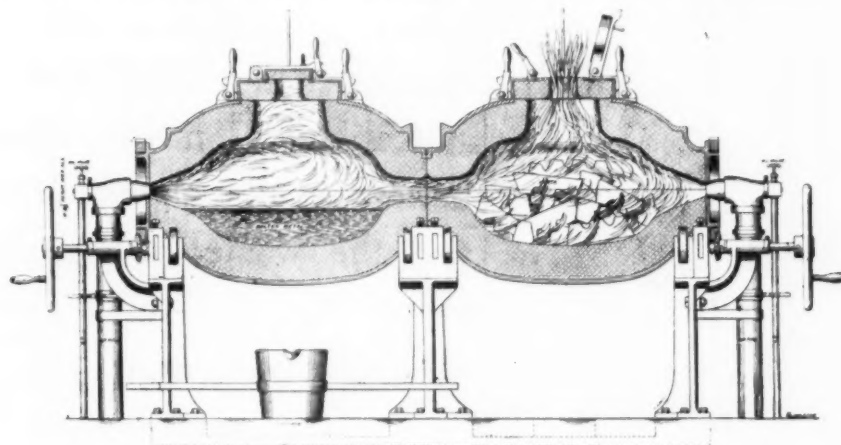
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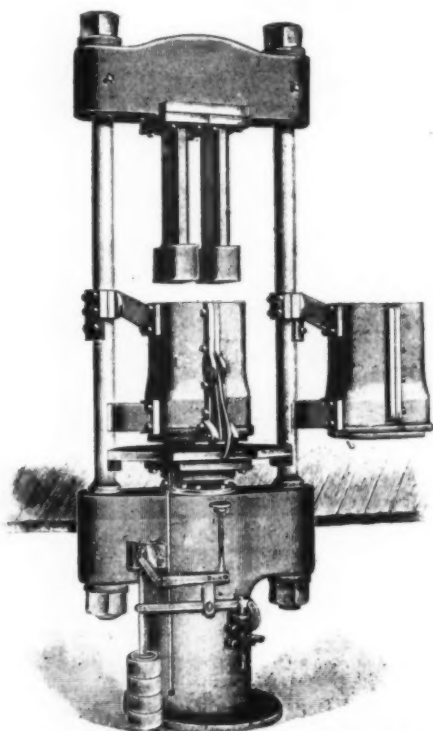
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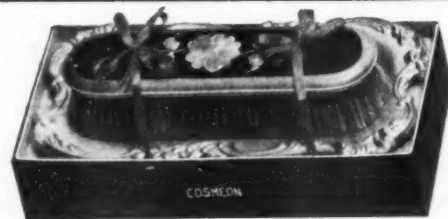
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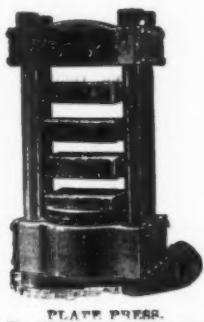
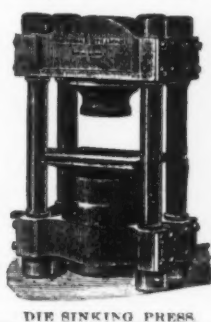


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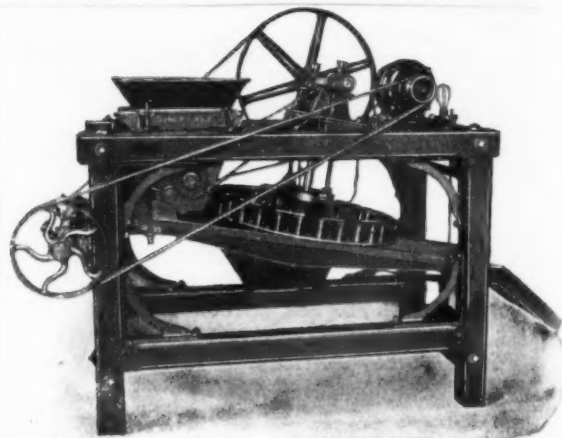
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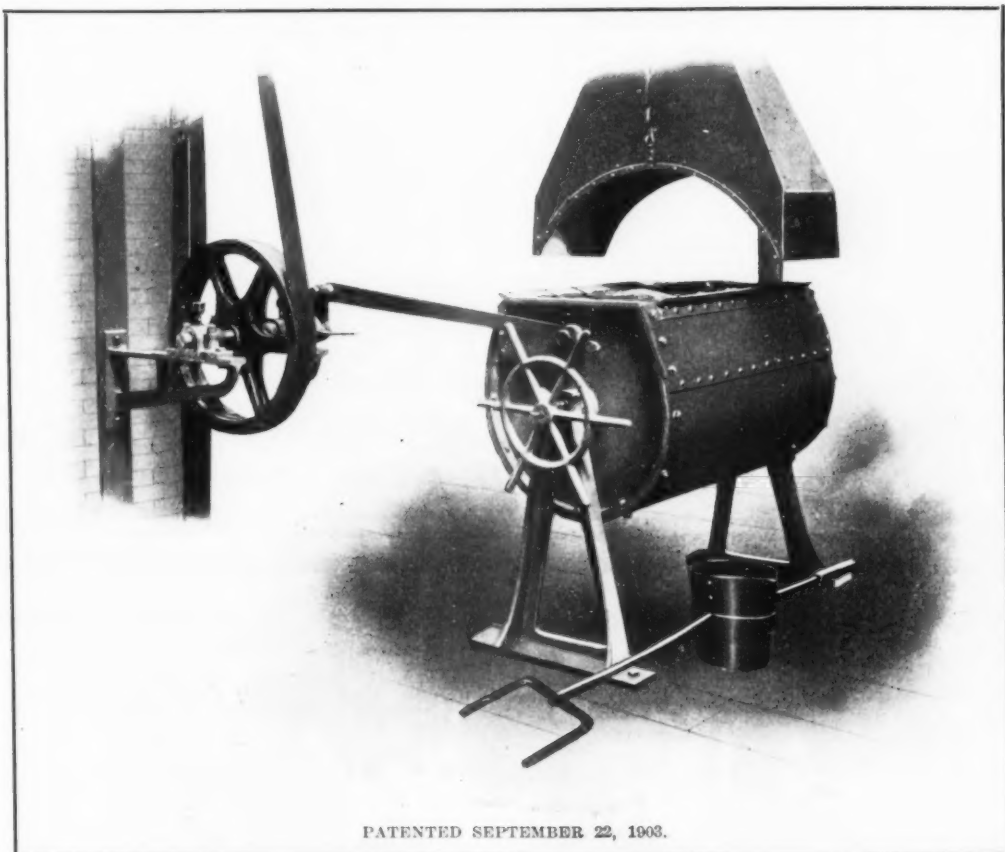
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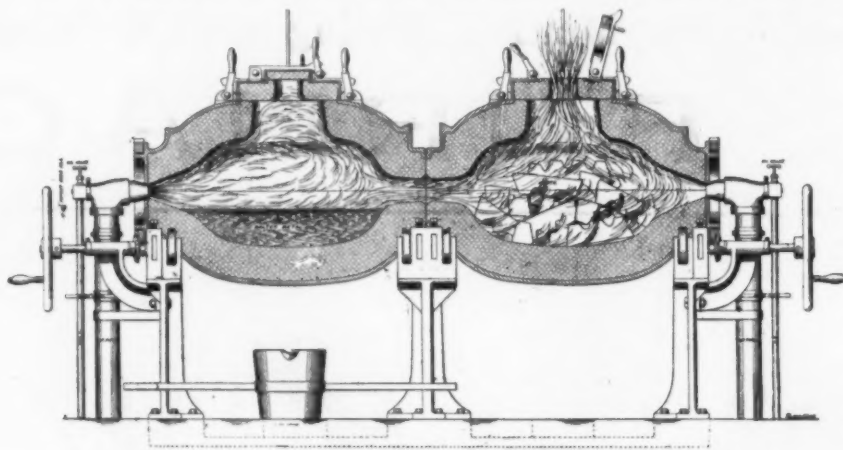
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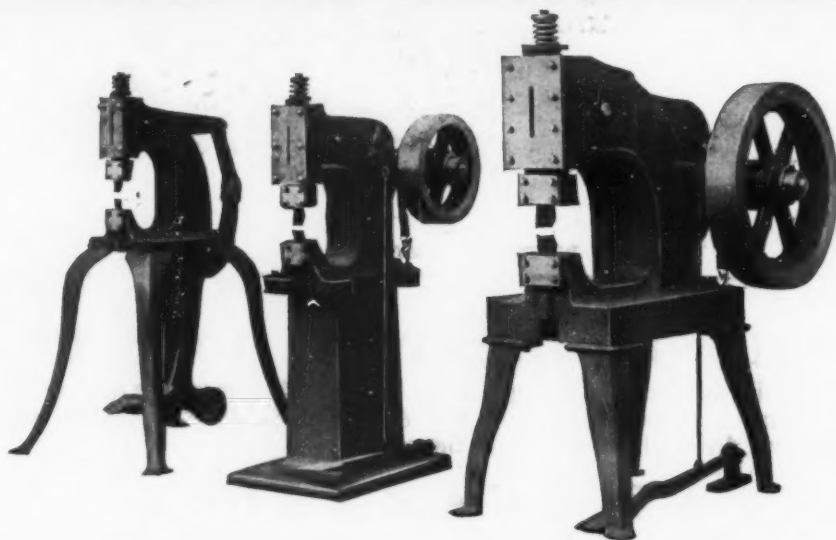
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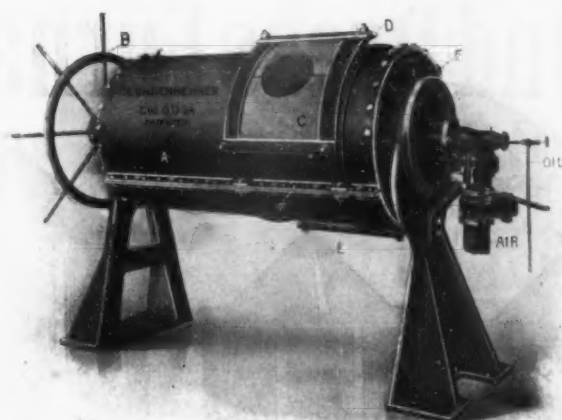
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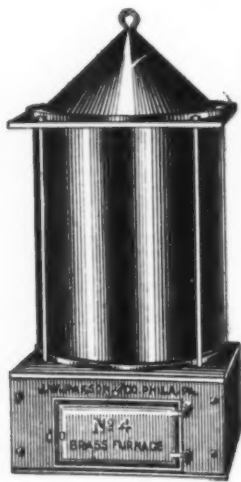
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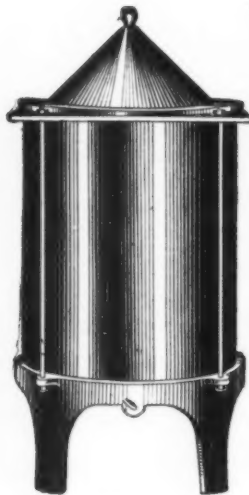
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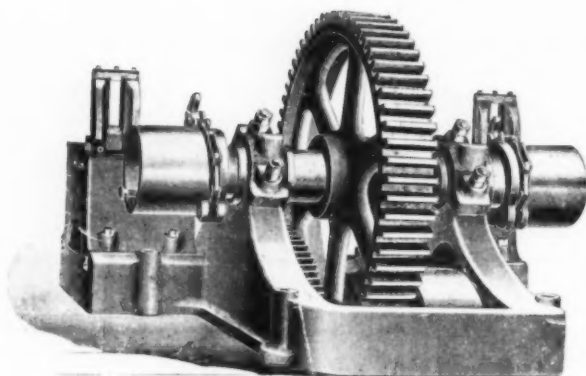
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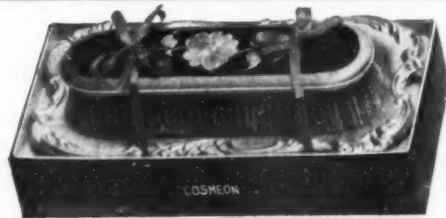
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Mugs, Collapsible Drinking Cups, Druggists Scale Pans
and Scoops, Card
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Pure Aluminum in Sheets and Foil to thinness
of $\frac{3-4}{1000}$ of an inch.

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Platers' Silver and Battery Plate 999 Fine. Platers' Brass, Oreide and German Silver
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Manufacturers of all kinds of

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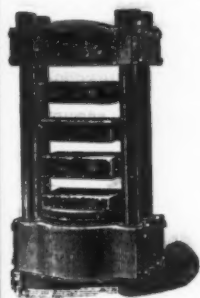
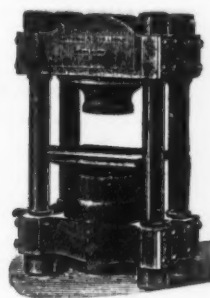


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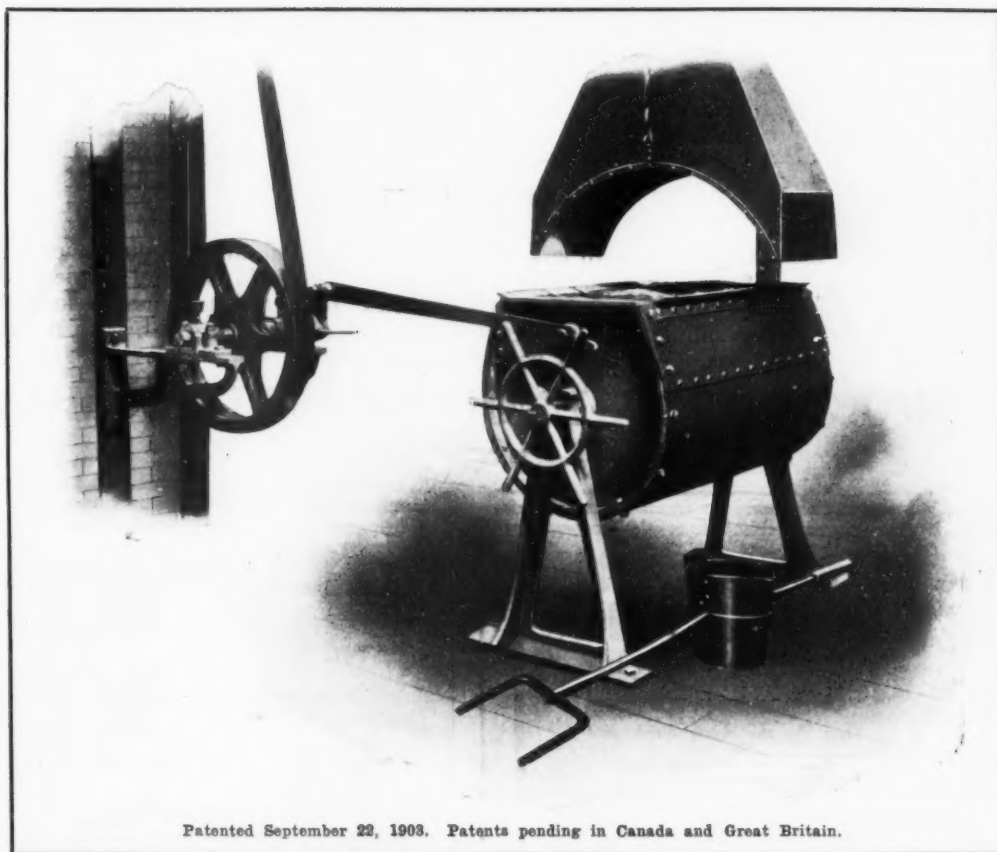
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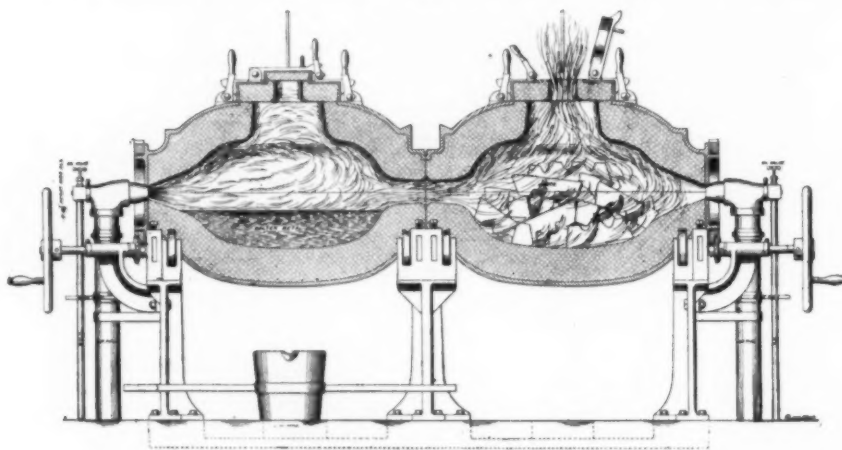
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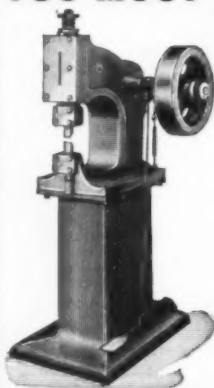
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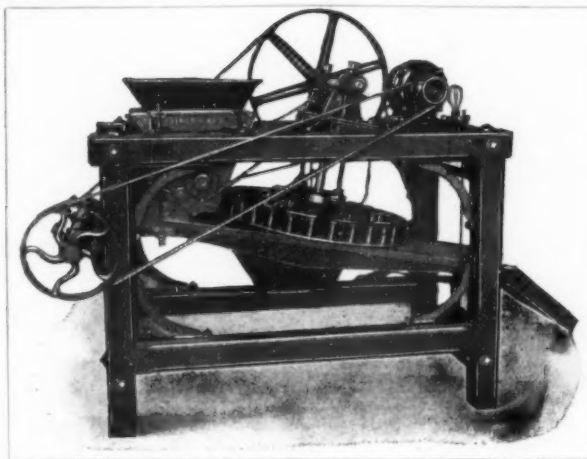
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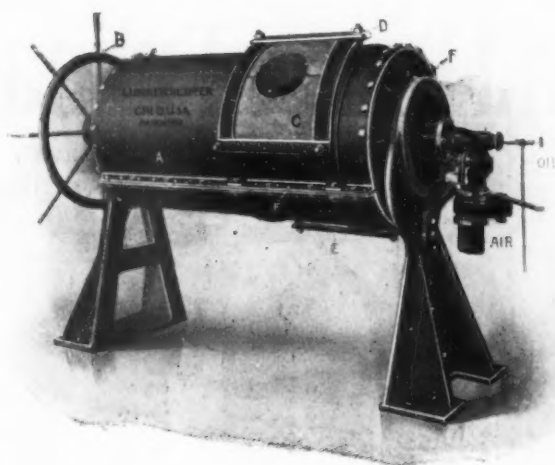


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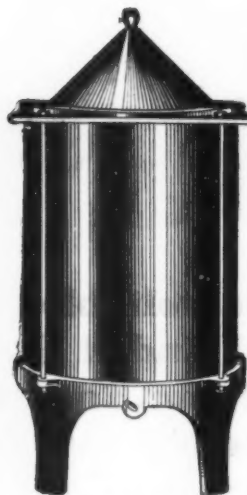
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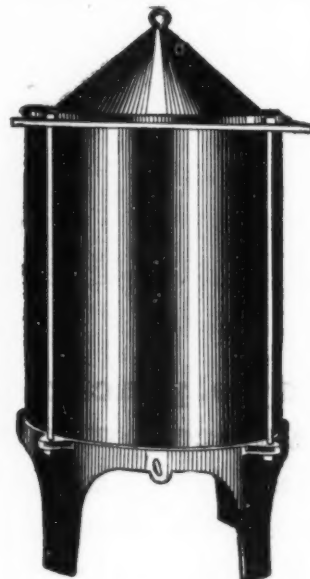
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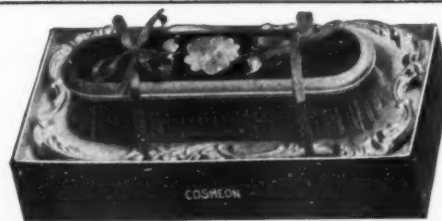
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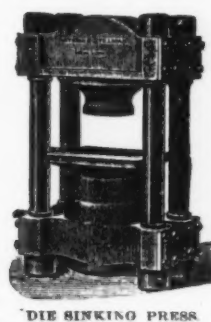
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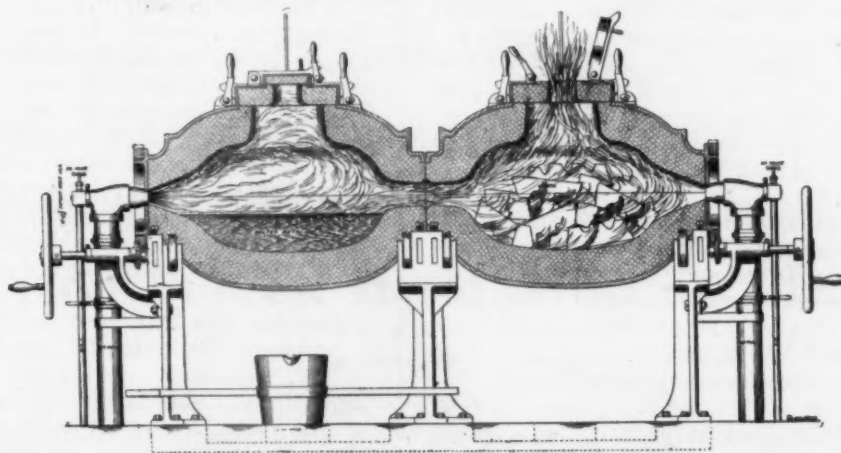
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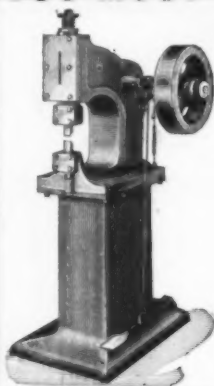
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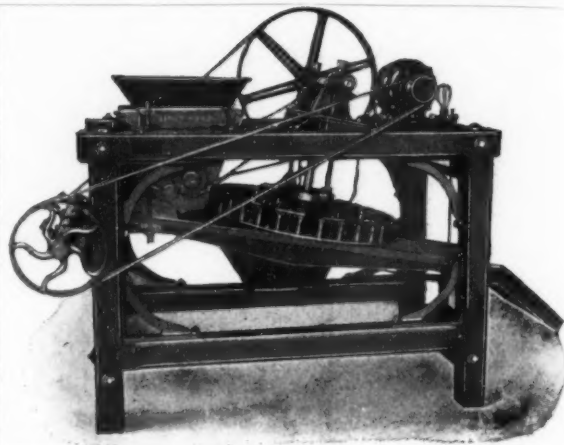
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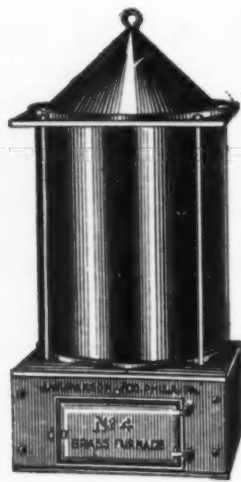
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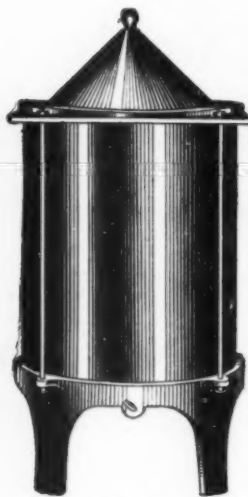
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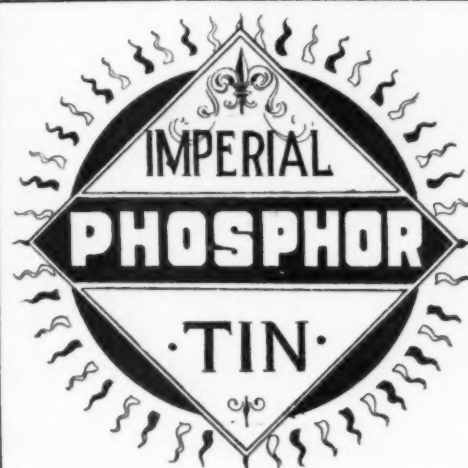
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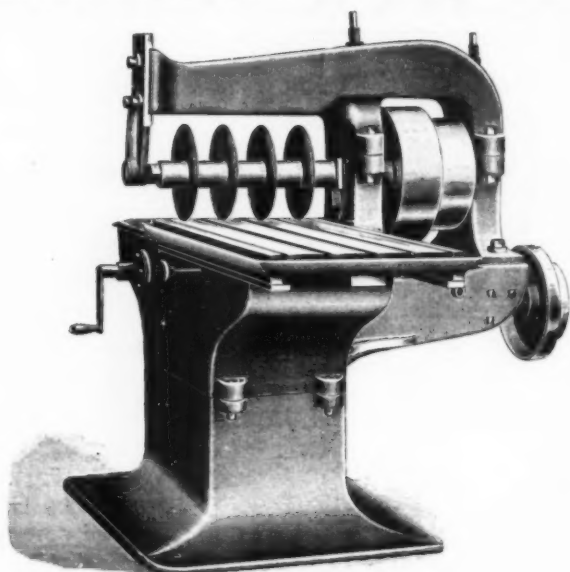
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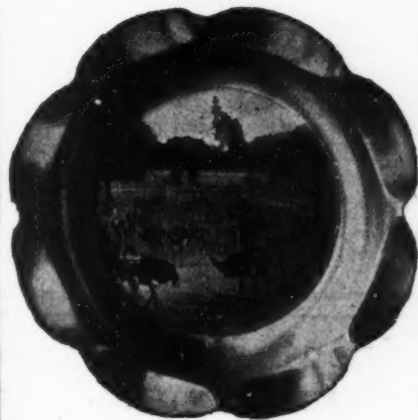
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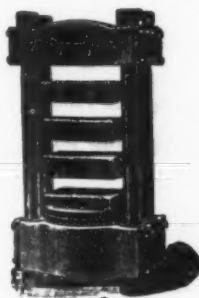
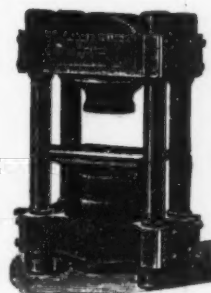


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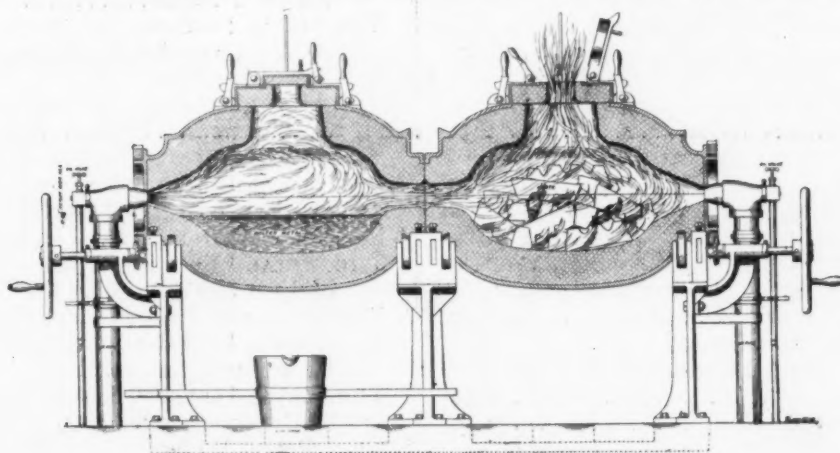
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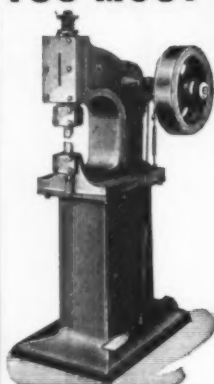


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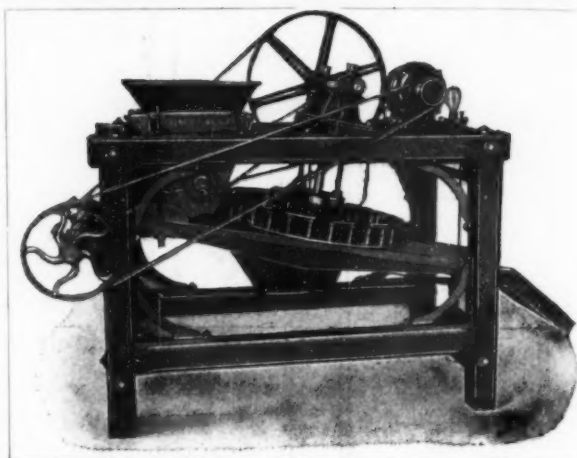
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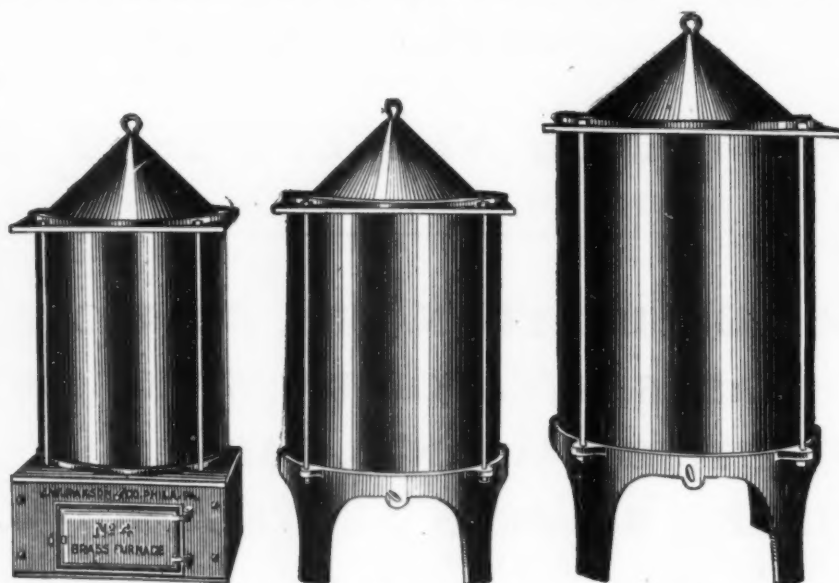
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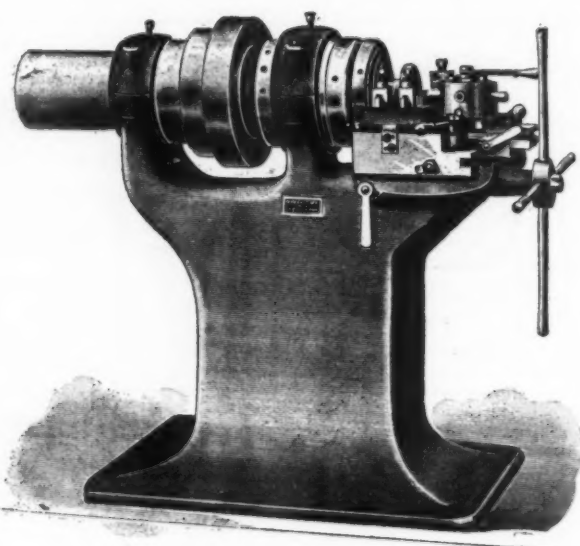
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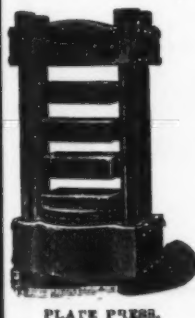


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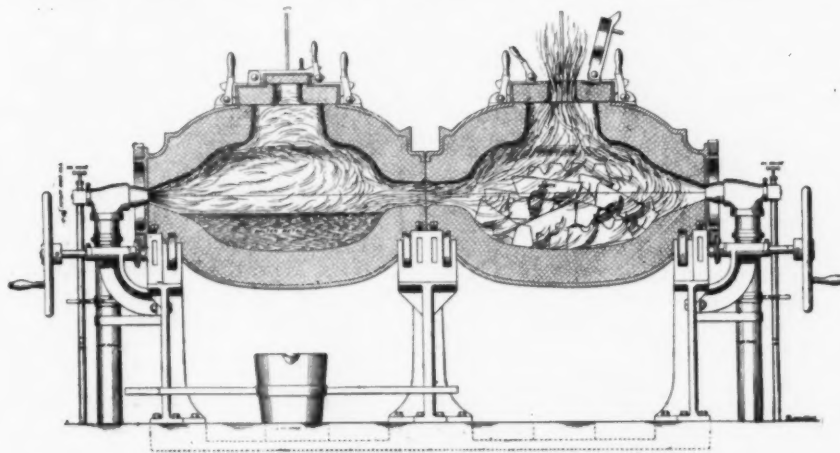
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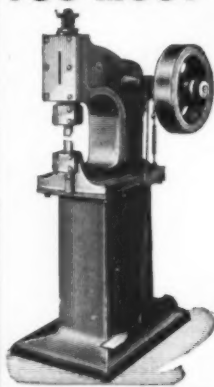
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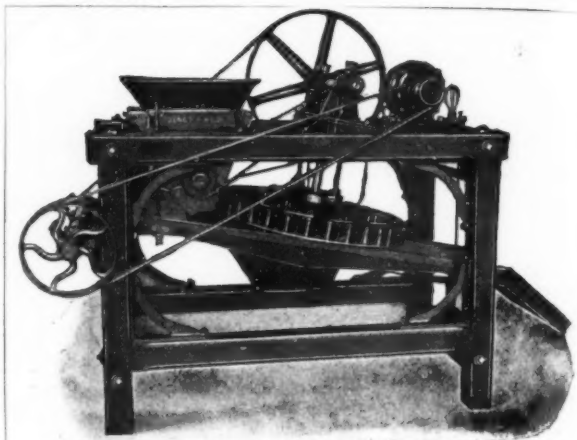
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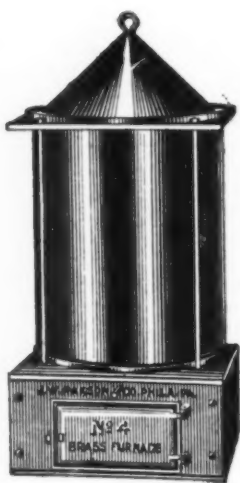
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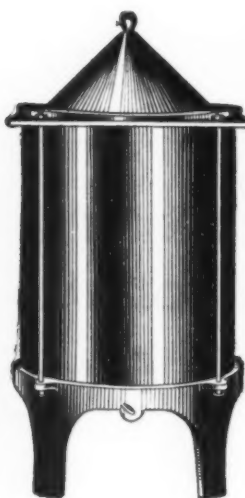
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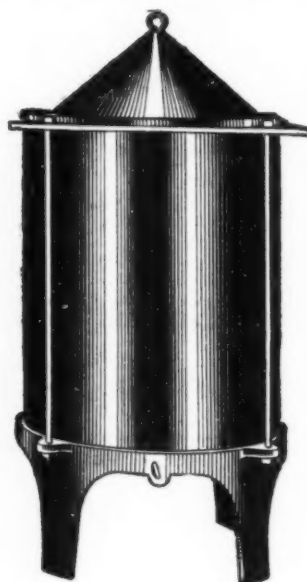
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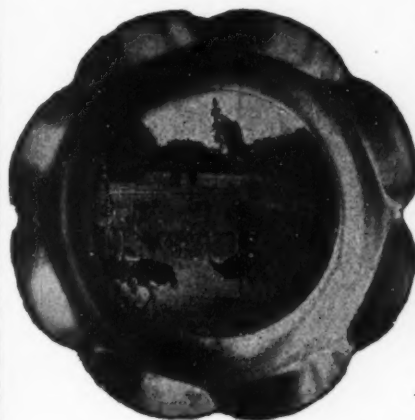
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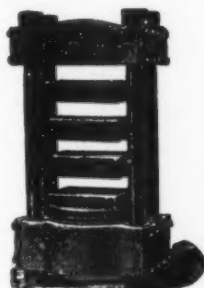
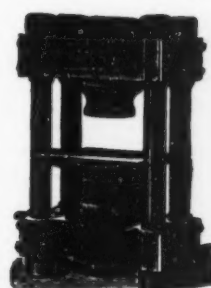


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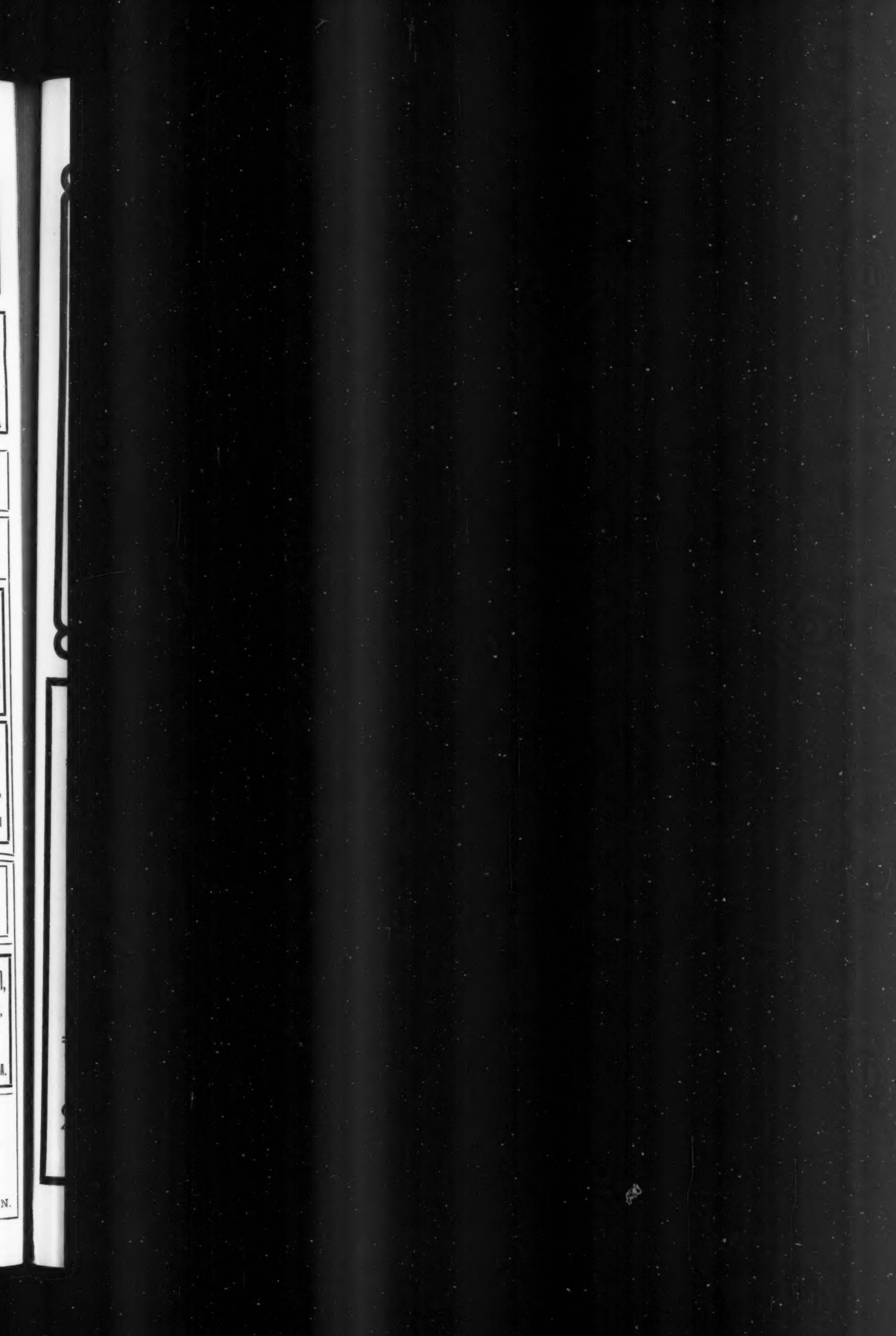
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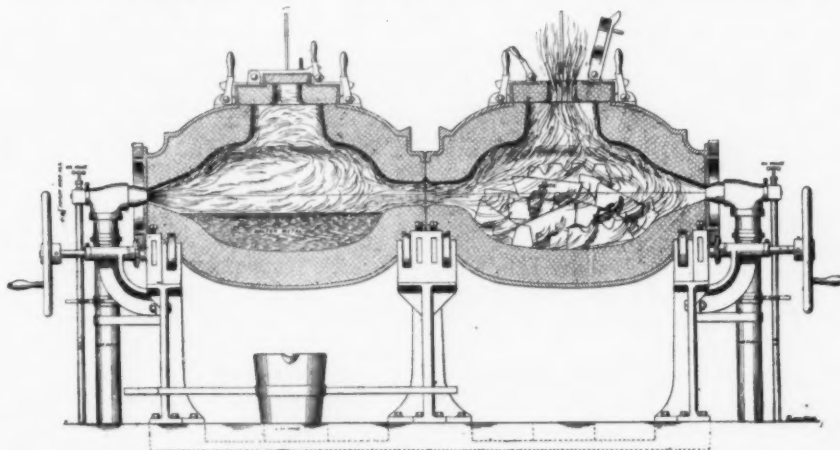
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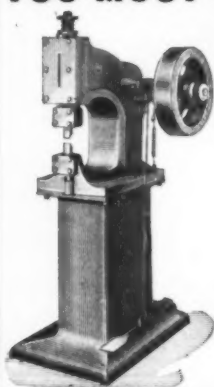
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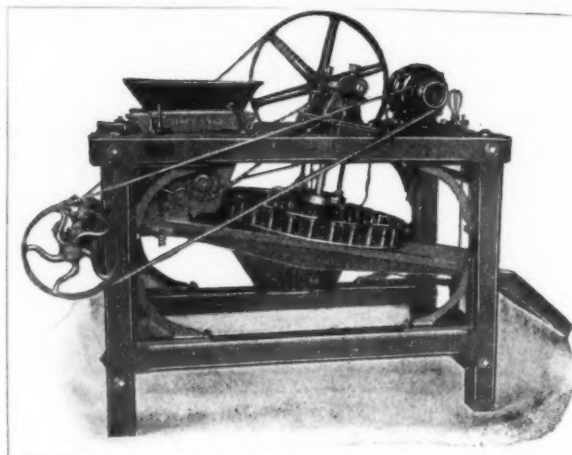
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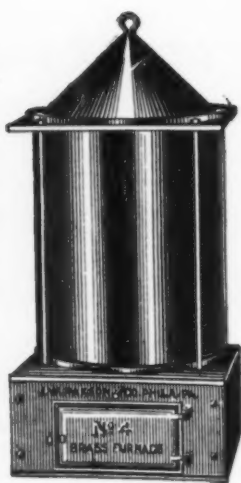
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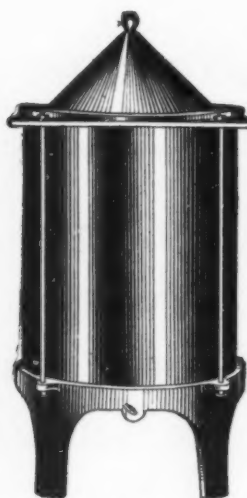
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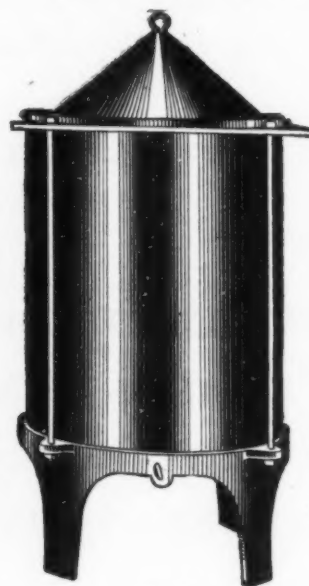
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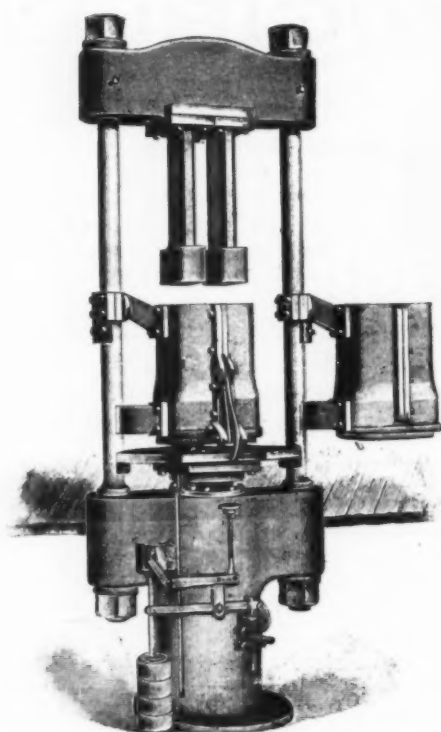
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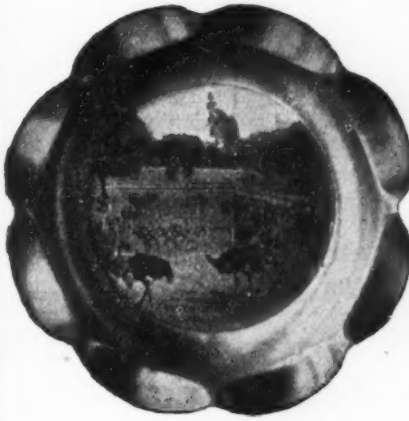


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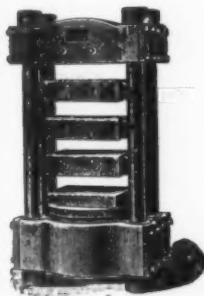
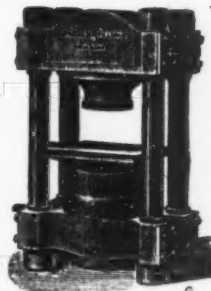


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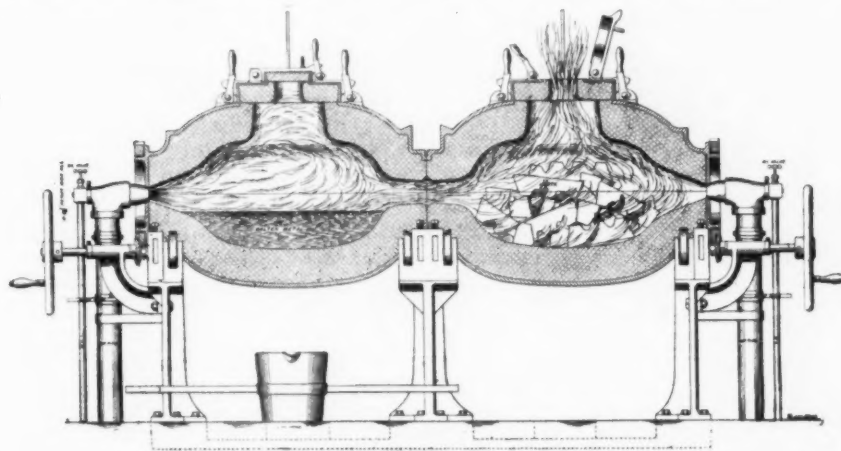
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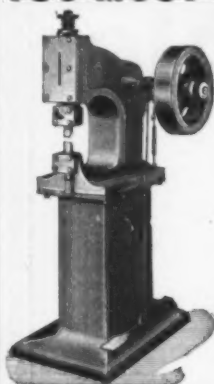
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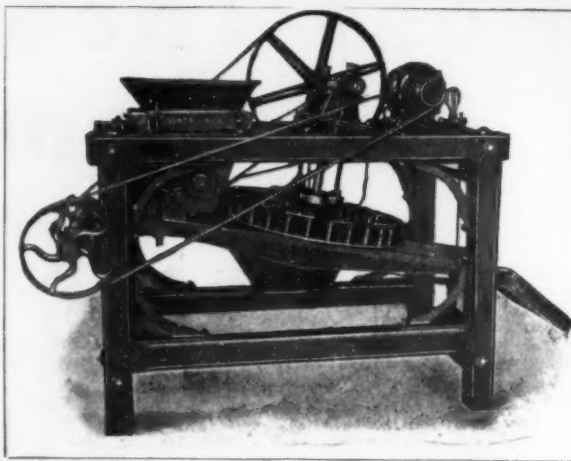
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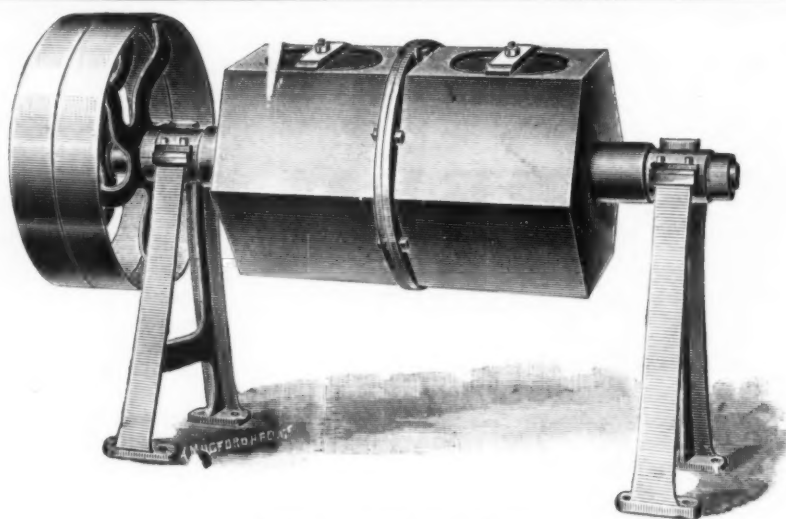
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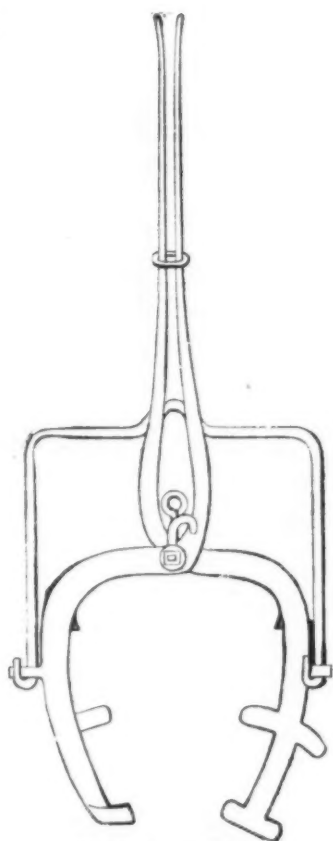
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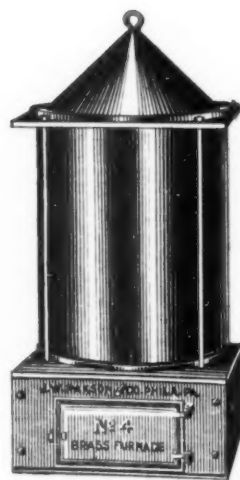


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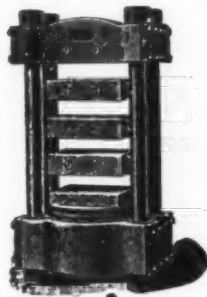
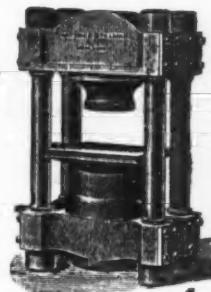


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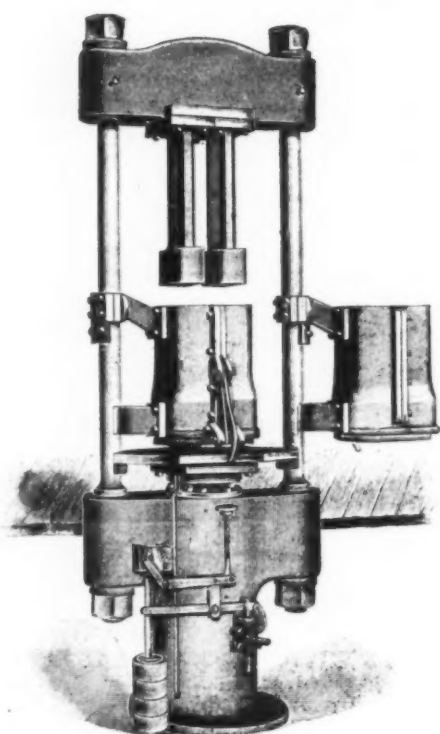
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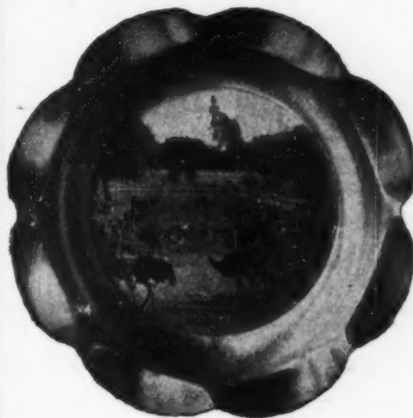
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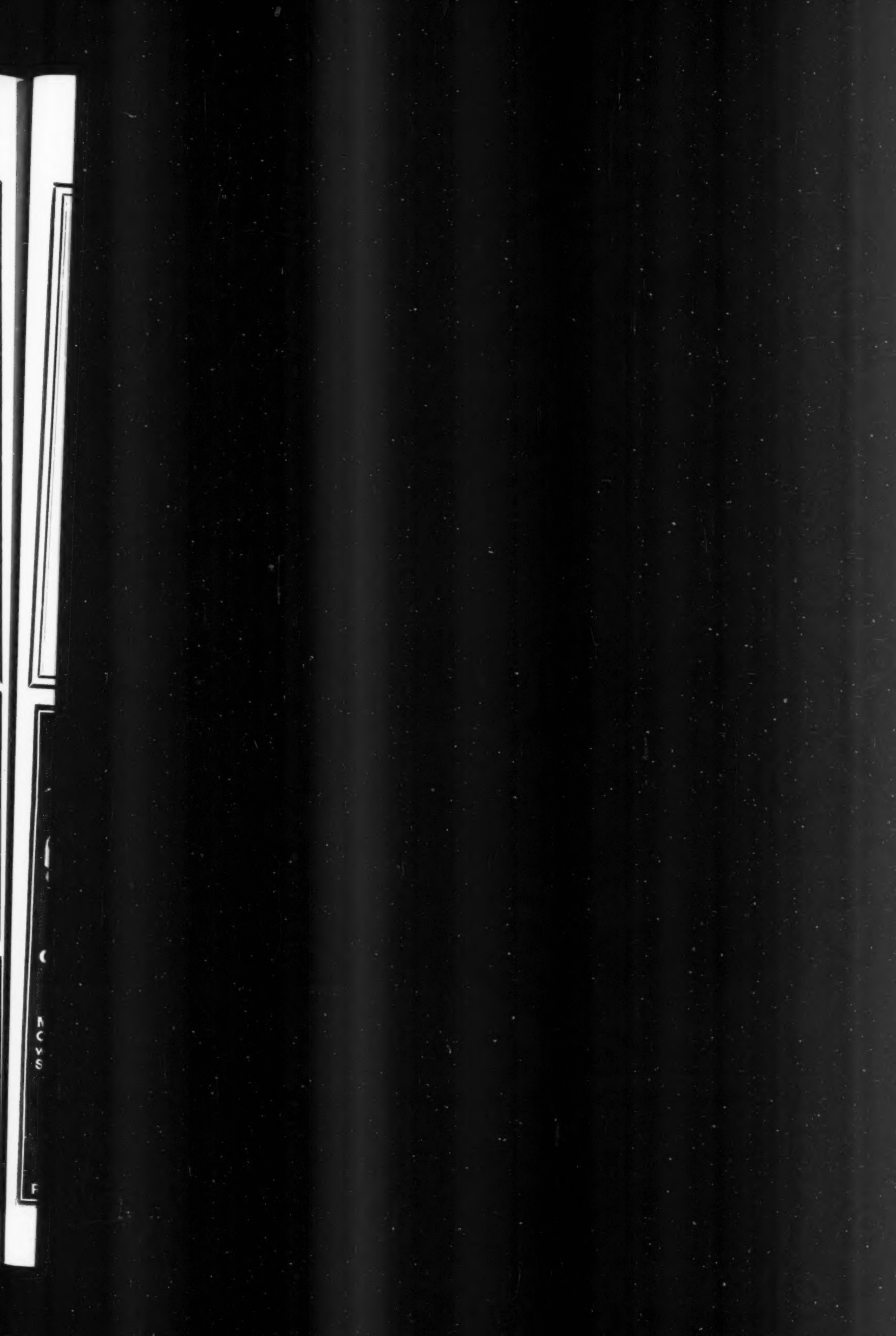
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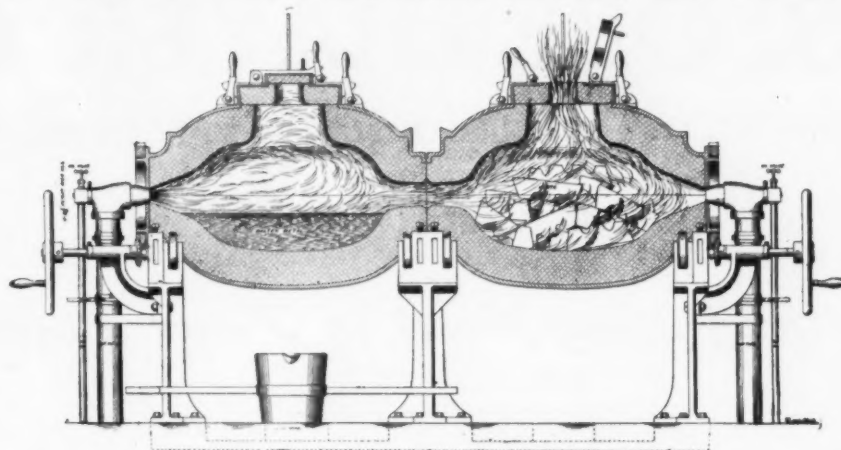
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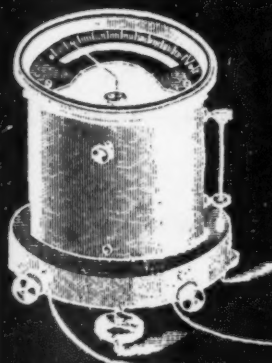
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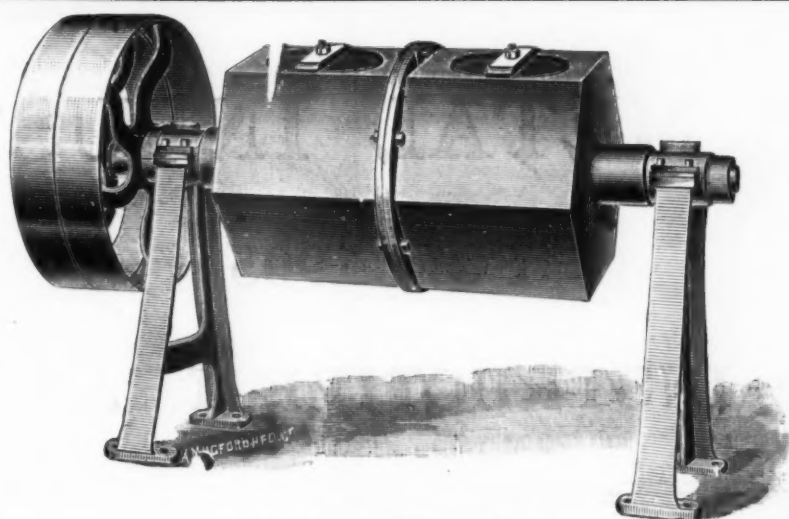
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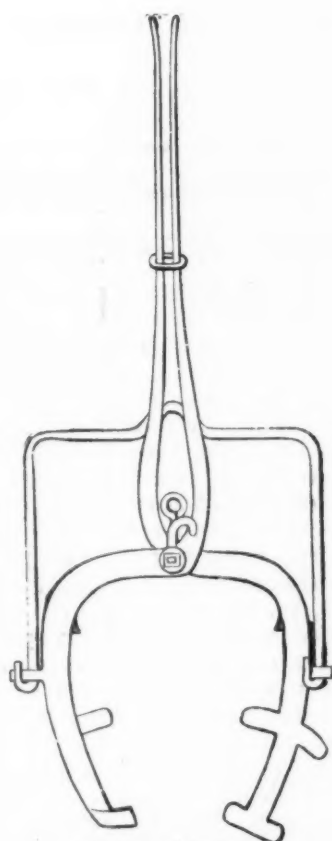
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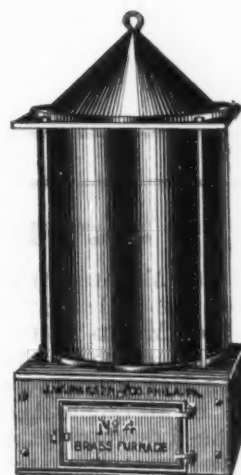
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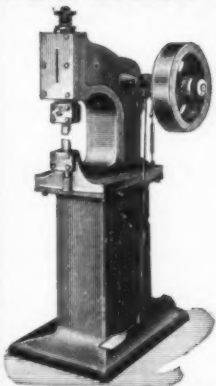


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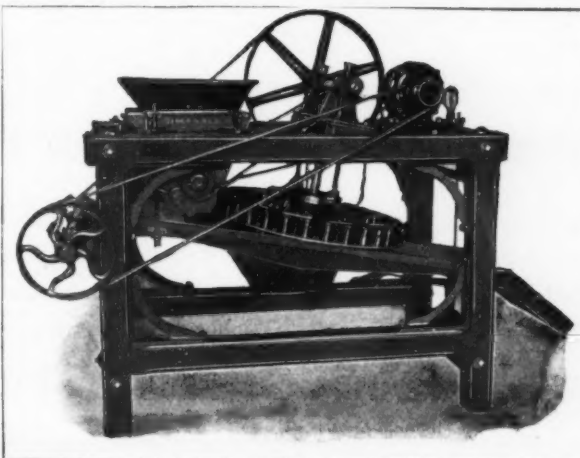
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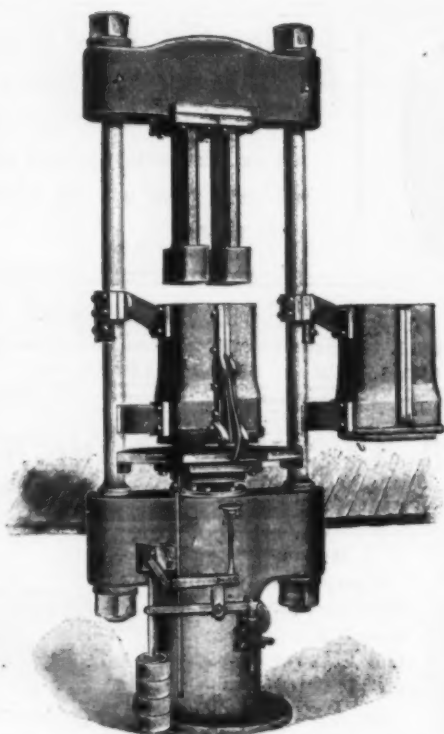
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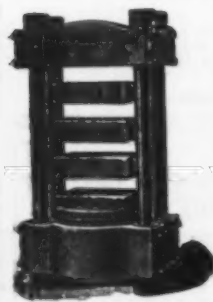
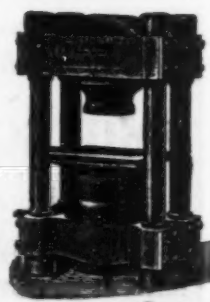


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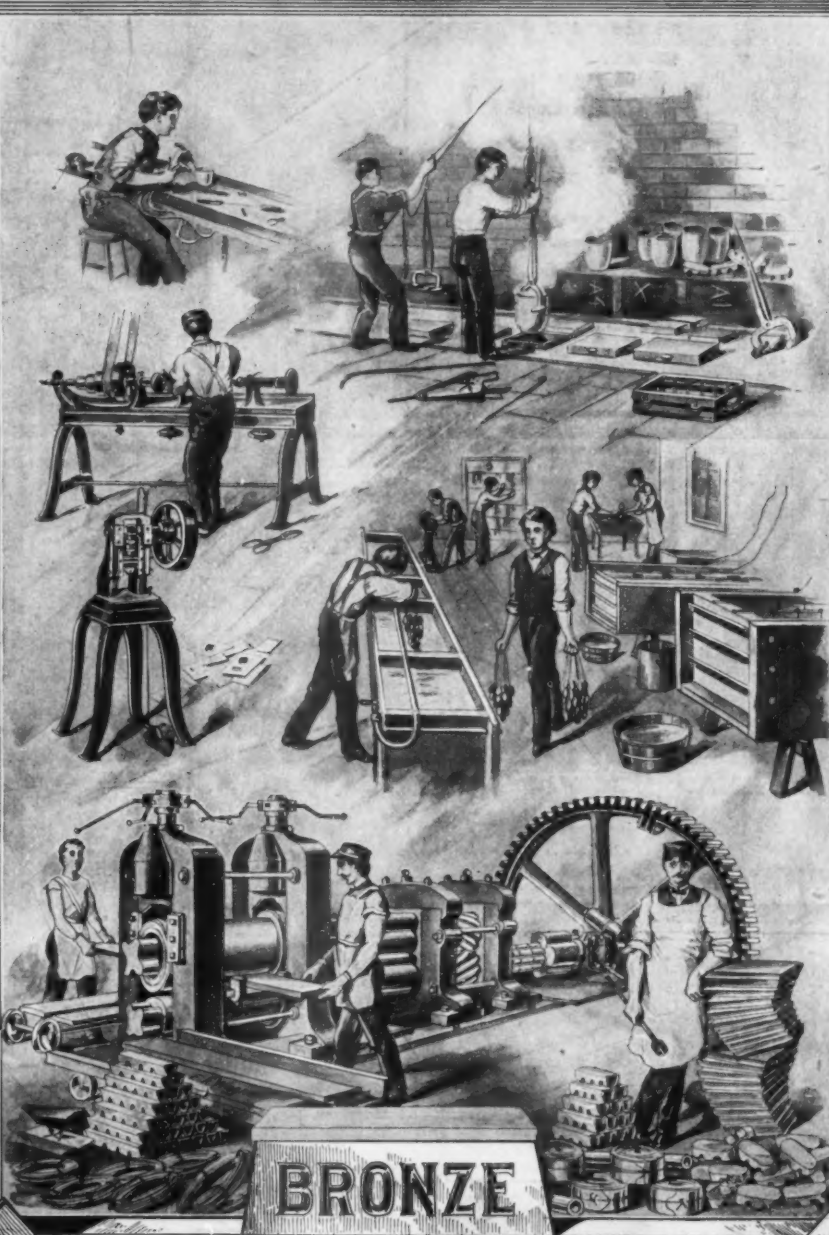
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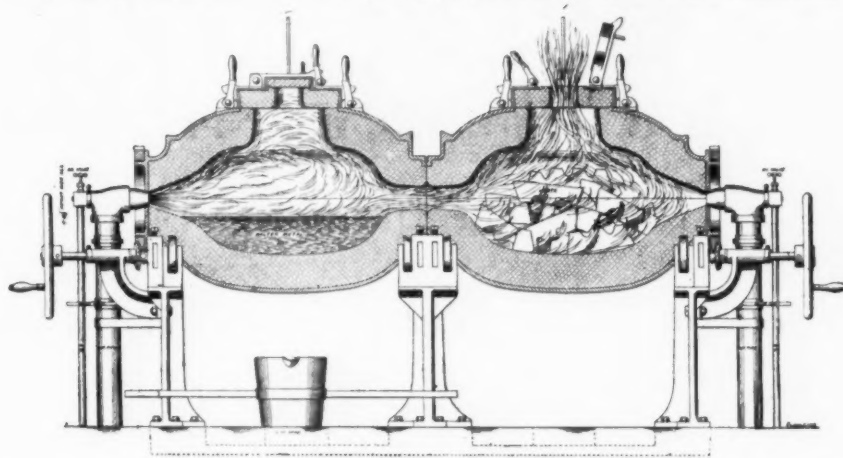
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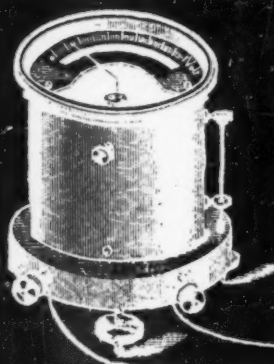
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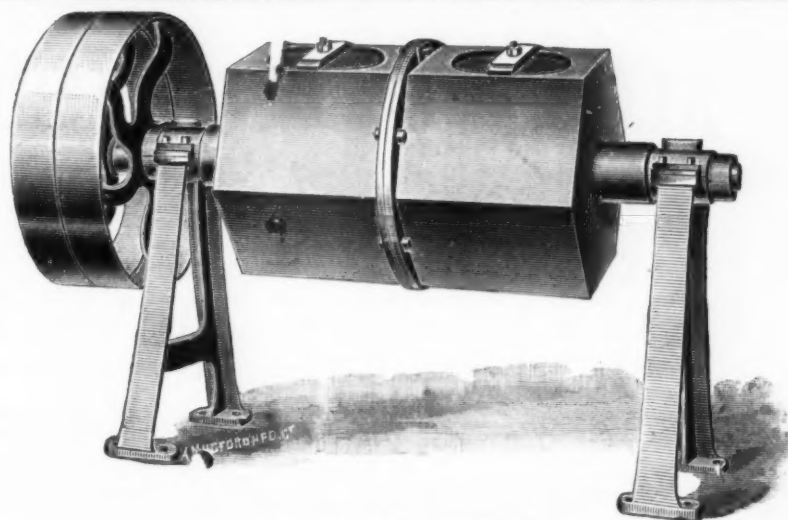
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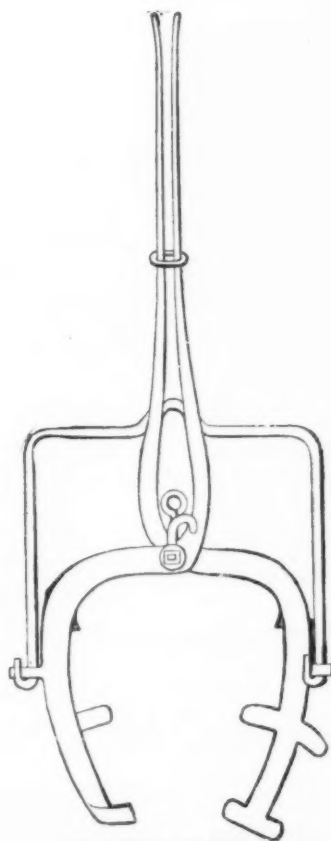
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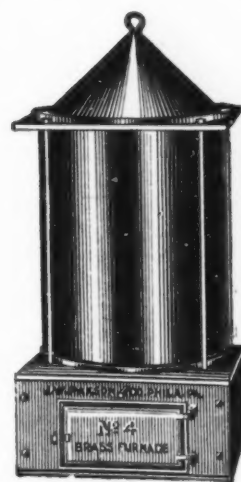
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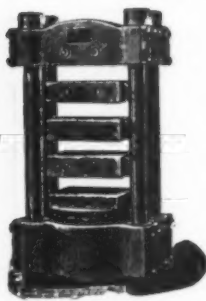
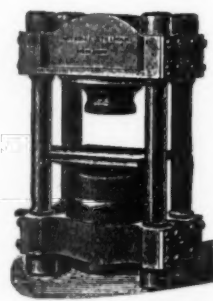


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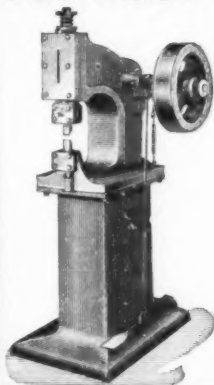
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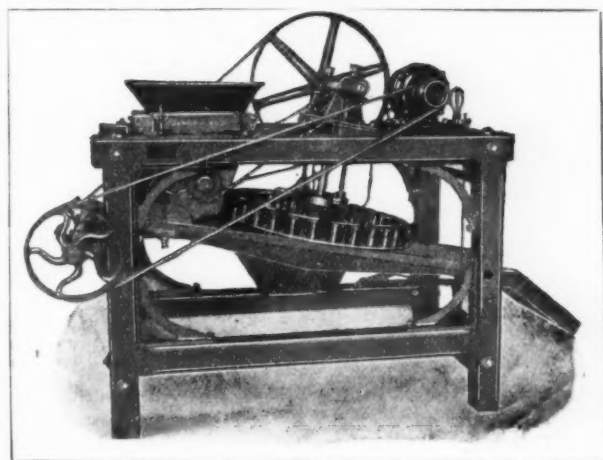


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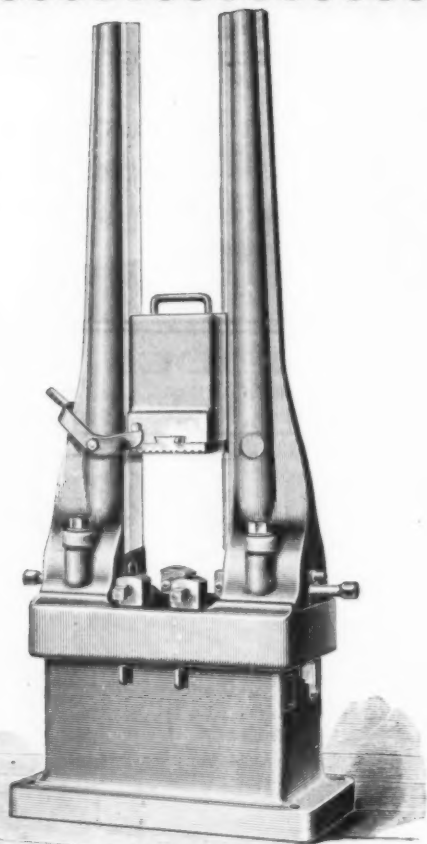
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Contains 90% of aluminum. Much lighter than most of the aluminum casting alloys. Makes a clean, smooth casting, is strong and tough and does not shrink excessively.

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A deoxidizer and flux for copper, bronze and brass. By its use a solid casting of pure copper can be made.

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